

Chapter 14. Potato Production

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Botany and Planting

Potato – *Solanum tuberosum*, Solanaceae.

Table 14.1. Planting information for potato.

Planting dates	
North Florida	Jan-Feb
Central Florida	Nov-Feb
South Florida	Oct-Jan
Planting information	
Distance between rows (inch)	36 - 42
Distance between plants (inch)	7 - 10
Planting depth (inch)	3 - 4
Average seed piece size (oz)	2.5 - 3.0
Average seed per planted acre (lb)	2000 - 3000
Days from planting to tuber maturity	85 - 110

Cultivars

1. CHIPPING TYPES

Atlantic. With high yield potential, high specific gravity and uniform tuber size and shape, Atlantic is the standard variety for chipping from the field or from very short-term storage. The cultivar is tolerant to scab and Verticillium wilt; resistant to pinkeye; and highly resistant to Race A of golden nematode, virus X and tuber net necrosis. Tubers are susceptible to internal heat necrosis, particularly in sandy soils in warm, dry seasons. Hollow heart in the larger diameter tubers (> 3 in) can be serious in some growing areas when growing conditions over the season fluctuate.

Elkton. Elkton is a medium to medium-late maturing potato variety with netted-skinned, round-oblong tubers, and white-flesh. Chip color processed directly from the field. Elkton is resistant to internal heat necrosis and moderately resistant to common scab, early blight, and Verticillium wilt; intermediate to moderately susceptible to late blight; moderately susceptible to powdery scab; and, susceptible to potato virus Y and potato virus S.

Harley Blackwell. Harley Blackwell is a round, white-fleshed, tan, netted-skin variety, resistant to internal heat necrosis, for chipping directly from the field in the mid-Atlantic states. Harley Blackwell is resistant to Race A of golden nematode, Verticillium wilt, and late blight. It is moderately susceptible to early blight with intermediate resistance to common scab and some tolerance to powdery scab.

2. FRESH MARKET/TABLE TYPES

Red LaSoda. Red LaSoda is an early to medium season, red-skinned variety that is primarily grown in the southeastern U.S. It is harvested in the winter months as a fresh market variety. Red LaSoda has a high yield potential of tubers with a pink to red color. Tubers size early. Tuber eye depth

and off-shape tubers are limitations. The cultivar is susceptible to early and late blights, scab, corky ringspot, and bacterial wilt. Red LaSoda is the top planted red-skinned potato variety in Florida.

LaRouge. LaRouge is a early to medium maturing, red-skinned variety that has a high tuber yield potential with tubers sizing early. Primary growing areas are in the southeastern U.S. The variety is grown for the fresh market and is generally not stored. LaRouge has good scab resistance but is susceptible to early and late blights, corky ringspot, and bacterial wilt. The deep eyes and irregular tuber shape are the major limitations. When harvested in southern states the relatively high yield, bright color, and good boiling qualities make it popular for markets in the late winter.

LaChipper. LaChipper is an early to midseason variety with moderate to high tuber yield and moderate specific gravity. It is the top planted fresh market white-skinned variety in Florida. Tubers are more elongated than round, somewhat flattened. Skin is smooth and white with medium to deep, cream colored eyes that are fairly evenly distributed. Tuber flesh is very white. LaChipper possesses some resistance to late blight. It is moderately susceptible to common scab. Exposure to air pollution can result in defoliation and reduction in tuber yield. Deep eyes and irregular shape are disadvantages on the tablestock market.

Yukon Gold. Yukon Gold has early-medium maturity, moderate yields, moderate specific gravity and relatively attractive tuber type. Tubers slightly oval, may be somewhat flattened with yellow-white skin and light yellow tuber flesh. Its shallow, pink eyes distinguish Yukon Gold from other yellow-skinned, yellow-fleshed cultivars. Yukon Gold is resistant to mild mosaic, moderately resistant to leafroll virus and susceptible to virus Y, common scab and air pollution. In some growing areas, hollow heart and internal heat necrosis may be a problem. Yukon Gold retains the yellow flesh color when baked, boiled or french-fried.

Goldrush. Goldrush is a medium maturing russet cultivar grown primarily for the fresh market. Russet-skinned tubers are oblong to long and average approximately 6-10 tubers per plant. Eyes are very shallow and well distributed; under some conditions they may show a reddish blush. Tuber flesh is very white and tuber dormancy is medium in duration. Goldrush has been observed to have moderate resistance to Verticillium wilt, good resistance to scab, moderate resistance to blackspot and some resistance to silver scurf. It is considered susceptible to most common potato viruses and other potato diseases, such as early blight, late blight, soft rot and Fusarium dry rot.

Marcy. Marcy is a white-flesh and white-skinned fresh market potato variety with an oval slightly flattened shape. Marcy tubers have an attractive oval shape, shallow eyes, and highly textured skin. Marcy is resistant to brown rot, common scab and race Ro1 of the golden cyst nematode. The variety is susceptible to PVX and PVY, hollow heart, Corky ring spot, and internal heat necrosis. Marcy has a specific gravity slightly lower than Atlantic, which is not a limitation for the tablestock market.

Table 14.2. Herbicides approved for managing weeds in potato. |

Labels change frequently. Be sure to read a current product label before applying any chemical.			
Active ingredient lb. a.i./A	Trade name product/A	MOA code	Weeds controlled / remarks
*** PREEMERGENCE / PRETRANSPLANT ***			
Carfentrazone up to 0.031	(Aim) 1.9 EW up to 2 fl. oz. (Aim) 2.0 EC up to 2 fl. oz.	14	Apply as a preplant burn down for emerged broadleaf weeds. Use crop oil concentrate, methylated seed oil, or nonionic surfactant at recommended rates. Maximum rate of 0.096 lb. a.i./A per season. No pretransplant interval.
Dimethenamid-p 0.56 - 0.84	(Outlook) 6 L 12 - 18 fl. oz.	15	Apply after planting or drag-off. Consult label for exact rates based on soil texture. In cold wet conditions, delayed crop emergence or stunting may occur. PHI 40 days.
EPTC 1	(Eptam) 20 G 15 lb.	8	Broadleaf and grass weeds and nutsedge. Apply preplant or after drag-off. Incorporate mechanically or with irrigation 2-4 in. deep. Do not apply the emulsifiable formulation preemergence in winter and early spring potatoes.
Flumioxazin 0.05	(Chateau) 51 WDG 1.5 oz.	14	Annual broadleaf weeds. Apply after hilling with a minimum of 2 in. of soil covering the vegetative portion of the potato plant. Should be tank mixed with other herbicides, especially for grass control.
Fomesafen 0.25	(Reflex, Ringside) 2 EC 1.0 pt.	14	Annual broadleaf and grass weeds. Effectiveness reduced if later cultural practices expose untreated soil. Can be applied after drag off and before crop emergence. Variety tolerance may vary, test on a small sample before application to the entire field. PHI 7 days.
Glyphosate	(various formulations) consult labels	9	Emerged broadleaf and grass weeds. Apply as a preplant burndown. Consult label for individual product directions.
Imazosulfuron 0.19-0.3	(League) 75 WG 4-6.4 oz.	2	Broadleaf and grass weeds. Limit of 2 applications per year and no more than 6.4 oz./A per year.
Linuron 0.75 - 1.25	(Lorox DF) 50 DF 1.5 - 2.5 lb. (Linex) 4 L 1 - 1.6 pt.	7	Apply after final drag-off. If weeds are present include a NIS. Best results are obtained in moist fields at application followed by rain or irrigation with 2 wk.
Metribuzin 0.25 - 1.0	(Tricor DF) 75 DF 0.3 - 1.3 lb.	5	Annual broadleaf weeds. Apply after drag-off but before crop emergence. Do not incorporate. Use lower rates on sandy soil.
Metribuzin + S-metolachlor	(Boundry) 6.5 EC 1.5 - 2.0 pt.	5 + 15	Broadleaf and grass weeds. Apply before potato emergence. This includes drag-off. Do not incorporate.
Paraquat 0.25 - 0.5	(Gramoxone) 2 SL 1.0 - 2.0 pt. (Firestorm) 3 SL 0.7 - 1.3 pt.	22	Emerged broadleaf and grass weeds. Apply as a preplant burndown treatment. Apply up to ground cracking before potatoes have emerged. Use a nonionic surfactant.
Pelargonic acid	(Scythe) 4.2 EC 3 - 10% v/v	27	Emerged broadleaf and grass weeds. Apply as a preplant burndown treatment. Product is a contact, nonselective, foliar applied herbicide with no residual control. May be tank mixed with soil residual compounds.
Pendimethalin 0.75	(Prowl H20) 3.8 1.5 pt.	3	Annual broadleaf and grass weeds. Apply after planting but before potatoes and weeds emerge or after drag-off. Incorporate with rainfall or mechanically into the top 1-2 in. of soil within 7 days. Do not use on peat or muck soils.
Pyraflufen 0.001 - 0.003	(ET Herbicide) 0.208 EC 0.5 - 2.0 fl. oz.	14	Emerged broadleaf weeds. Apply as a preplant burndown treatment.
Rimsulfuron 0.016 - 0.023	(Matrix) 25 DF 1.0 - 1.5 oz.	2	Apply immediately after drag-off. Rainfall or sprinkler irrigation 0.3-1.0 in. required with 5 days after application. Do not exceed 2.0 oz./A per year.
Sulfentrazone 0.09 - 0.14	(Willowood sulfentrazone) 4SC 3.0 - 4.5 fl. oz.	14	Broadleaf and grass weed control, Nutsedge suppression. Do not apply on sands with less than 1% organic matter. Do not apply more than 8 fl. oz./A within a 12 mo. period. Should be trialed on a small area to find suitable rate for the soil type in your area.
S-metolachlor 0.95 - 1.9	(Dual Magnum) 7.62 EC 1.0 - 2.0 pt.	15	Annual broadleaf and grass weeds. Apply after drag-off before crop and weed emergence. If cool, wet soil conditions occur after application, a delay in maturity and/or reduced yield may occur. PHI 60 days.
Trifluralin 0.5	(Trust, Treflan TR-10) 10 G 5 lb. (Trifluralin, Treflan) 4 L 1 pt.	3	Broadleaf and grass weeds. Apply after dragoff or prior to crop emergence. Incorporate the herbicide into the soil profile. If applied after plant emergence do not allow soil contact with the emerged plants.
*** POSTEMERGENCE ***			
Carfentrazone up to 0.031	(Aim) 1.9 EW up to 2 fl. oz. (Aim) 2.0 EC up to 2 fl. oz.	14	Emerged broadleaf weeds. Apply as hooded application to row middles only. Use a COC or NIS at recommended rates. May be tank mixed with other herbicides. Do not exceed 6.1 fl. oz. per cropping season. PHI 7 days.

Table 14.2. Herbicides approved for managing weeds in potato. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.			
Active ingredient lb. a.i./A	Trade name product/A	MOA code	Weeds controlled / remarks
Clethodim 0.09 - 0.25	(Arrow, Select) 2 EC 6 - 16 fl. oz. (Select Max) 1 EC	1	Perennial and annual grass weeds. In fields with heavy grass pressure or larger grass weeds, use higher rates or repeat application 14 days apart. Use a crop oil concentrate at 1% v/v in the finished spray volume. Nonionic surfactant with Select Max. PHI 30 days.
0.07 - 0.25	9 - 32 fl. oz.		
Imazosulfuron 0.19-0.3	(League) 75 WG 4-6.4 oz.	2	Broadleaf and grass weeds. Limit of 2 applications per year and no more than 6.4 oz./A per year. PHI 45 days.
EPTC 3	(Eptam) 20 G 15 lb. (Eptam) 7 E	8	Annual broadleaf, grass weeds and nutsedge. Apply at layby to a clean cultivated soil. Incorporate mechanically or with irrigation. Apply Eptam 7 E after true leaves have formed and apply as a layby treatment. Do not exceed 12.25 lb. a.i. per season. PHI 45 days.
3.1 - 7.9	3.5 to 9 pt.		
Metribuzin 0.23 - 0.5	(Tricor) 75 DF 0.3 - 0.6 lb.	5	Broadleaf and grass weeds. Do not apply to early smooth skinned, red skinned, and other specified varieties on the label. Do not exceed 1.3 lb. of product /A. PHI 60 days.
Pelargonic acid	(Scythe) 4.2 EC 3 - 10% v/v	27	Emerged broadleaf and grass weeds. Direct spray to row middles. Product is a contact, nonselective, foliar applied herbicide with no residual control. May be tank mixed with several soil residual compounds.
Rimsulfuron 0.016 - 0.023	(Matrix) 25 DF 1.0 - 1.5 oz.	2	Apply immediately after drag-off. Rainfall or sprinkler irrigation 0.3-1.0 in. required within 5 days after application. Apply as a sequential treatment 14 to 28 days after the first application. Do not exceed 2.0 oz./A per year.
Sethoxydim 0.28 - 0.47	(Poast) 1.5 EC 1.5 - 2.5 pt.	1	Control growing grass weeds. A total of 5.0 pt./A applied in one season. Include a crop oil concentrate. Unsatisfactory results may occur if applied to grass under stress. PHI 30 days.

Table 14.3. Insecticides labeled for management of arthropod pests of potato.

Labels change frequently. Be sure to read a current product label before applying any chemical. Also refer to Table 19.1 for biopesticide and other alternative products labeled for disease management.						
Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
Aphids	1A	*Lannate LV; *SP (methomyl)	LV: 1.5-3.0 pt SP: 0.5-1.0 lb	48	6	Do not make more than 10 applications per crop or apply more than 15 pt (LV) or 5 lb (SP) per acre per crop.
	1B	Dimethoate 4 EC (dimethoate)	0.5-1.0 pt	48	0 if mechanically harvested, 14 otherwise	Highly toxic to bees. Do not apply more than 2 pts per acre per year.
	1B	Malathion 5EC, 8F (malathion)	5EC: 1.5-2.5 pt 8F: 1-1.5 pt	12	0	Maximum of two applications per year.
	3A	*Ambush 25W (permethrin)	3.2-12.8 oz	12	14	Do not apply more than 1.6 lb active ingredient per season (102.4 oz).
	3A	*Asana XL (0.66 EC) (esfenvalerate)	2.9-9.6 fl oz	12	7	Do not apply more than 0.35 lb ai/acre per season (7 applications at highest rate).
	3A	Aza-Direct (azadirachtin)	1-2 pts, up to 3.5 pts, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
	3A	*Mustang (zeta-cypermethrin)	1.4-4.3 oz	12	1	A maximum of 0.3 lb ai/acre per season may be applied.
	3A	*Pounce 25 WP (permethrin)	6.4-12.8 oz	12	14	Do not apply more than 0.8 lb ai/acre per season.
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5-18.0 fl oz	12	0	Harmful to bees. Degrades rapidly in sunlight. Good coverage essential. OMRI-listed ² .
	3A	*Warrior II (lambda-cyhalothrin)	0.96-1.92 fl oz	24	7	Only exposed insects can be controlled. Do not apply more than 7.68 fl oz of product per acre per season.

Table 14.3. Insecticides labeled for management of arthropod pests of potato. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical. Also refer to Table 19.1 for biopesticide and other alternative products labeled for disease management.

Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
	3A, 4A	*Endigo ZC (lambda-cyhalothrin, thiamethoxam)	3.5-4.5 fl oz	24	14	Do not exceed a total of 10 fl oz of product per acre per growing season. Do not use with other Group 4A insecticides.
	4A	Actara (thiamethoxam)	1.5-3.0 oz	12	14	Toxic to bees. Do not use following soil application of other Group 4A insecticides. Maximum 6 oz/acre per season.
	4A	Admire Pro (imidacloprid)	5.7-8.7 fl oz as soil treatment or as seed piece treatment: 3.5-7.0 fl oz/100 lb seed foliar: 1.3 fl oz	12	at planting, see label for options; foliar: 7	Do not apply more than, 0.31 lb ai per acre per season. Seed piece rate is based on seeding rate of 2000 lb/acre. Foliar: Maximum for foliar applications per year: 5.6 fl oz.
	4A	Assail 30SG (acetamiprid)	1.5-4.0 oz	12	7	Do not make more than 4 applications per season. Do not exceed a total of 0.3 lb ai (16 oz of product) per acre per season.
	4A	Belay Insecticide (clothianidin)	9-12 fl oz (in-furrow or side dress application); 2-3 fl oz (foliar)	12	foliar: 14, or at planting or sidedress or spray at ground crack over row at hilling	See label for in-furrow, side dress and seed-piece applications. Do not apply during bloom or allow to drift to flowering plants. Toxic to bees for five days after application.
	4A, 3A	Leverage (imidacloprid + cyfluthrin)	3-3.75 fl oz		7	Leverage should not be used in fields treated with Admire Pro or other 4A products. There have been reports of low levels of resistance to imidacloprid. To minimize selection for resistance, do not use foliar applications of any IRAC MOA class 4A insecticides if any of these compounds were applied to the crop as soil or seed piece treatments. Utilize crop rotation and insecticide rotation to minimize Colorado potato beetle resistance.
	4A	Platinum 75SG (thiamethoxam)	1.66-2.67 oz	12	applied at planting or at plant emergence	To manage resistance, avoid using other Group 4A insecticides in conjunction with Platinum. One soil application per year.
	4A	Scorpion 35SL (dinotefuran)	foliar: 2-2.75 fl oz soil: 11.5-13.25 fl oz	12	foliar: 7 soil: see label	Apply as foliar or soil application, but not both. Maximum per acre per season for foliar use: 8 fl oz. Maximum when applied to soil=13.25 fl. oz. Do not apply where bees are foraging. Toxic to bees for 38 hours after application.
	4A	Venom Insecticide (dinotefuran)	foliar: 1-1.5 oz soil: 6.5-7.5 oz	12	foliar: 7 soil: at planting	Do not apply more than 4.5 oz per acre per season to foliage. One soil application, either preplant, preemergence, or at ground crack. Do not use with other Group 4A insecticides. Do not apply where bees are foraging. Toxic to bees for 38 hours after application.
	4C	Transform (sulfoxaflor)	0.75-2.25 oz	24	7	Bloom and tank mix restrictions apply.
	4D	Sivanto Prime (flupyradifurone)	7-14 fl oz	4	7	Minimum interval between applications=7 days. Maximum amount per year=28 fl oz/acre.
	9B	Fulfill (pymetrozine)	2.75-5.5 oz	12	14	Apply when aphids first appear. Do not exceed 11.0 oz per acre per season.
	23	Movento (spirotetramat)	4.0-5.0 fl oz	24	7	Maximum of 10 fl oz/acre per season.
	28	Exirel (cyazypyr)	13.5-20.5 fl oz	12	1	Do not apply more than 0.4 lb ai/acre of cyazypyr or cyantraniliprole containing products per crop whether applications are made to foliage or soil. See label for diamondback moth resistance management.
	28	Verimark (cyazypyr)	13.5 fl oz soil at planting	4	N/A: applied at planting	See label for diamondback moth resistance management.
	29	Beleaf 50 SG (flonicamid)	2.0-2.8 oz	12	7	Begin applications before pest populations reach damaging levels. Do not apply more than 8.4 oz/acre per season.
	--	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.
	--	Neemix 4.5 (azadirachtin)	4-16 fl oz	12	0	Insect growth regulator and anti-feedant. OMRI-listed ² .
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed ² . Antifeedant, repellent, insect growth regulator.

Table 14.3. Insecticides labeled for management of arthropod pests of potato. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.
Also refer to Table 19.1 for biopesticide and other alternative products labeled for disease management.

Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
	--	Requiem EC (extract of <i>Chenopodium ambrosioides</i>)	2-3 qt	4	0	Treat when threshold reached.
	-	Mycotrol ESO (<i>Beauveria bassiana</i> strain GHA)	0.25-1 quart per acre. Apply in sufficient water to cover foliage, typically 5-100 gallons per acre.	4	0	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Compatible as a tank mix with some fungicides.
	-	BotaniGard ES (<i>Beauveria bassiana</i> strain GHA)	0.25-1 quart per acre. Apply in sufficient water to cover foliage, typically 5-100 gallons per acre.	4	0	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Compatible as a tank mix with some fungicides.
	-	Suffoil-X (mineral oil)	1-2% v/v	4	0	OMRI-listed ² .
	--	Trilogy (extract of neem oil)	1.0% - 2.0% V/V	4	0	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed ² .
	--	Grandevo (<i>Chromobacterium subsugae</i> strain PRAA4-1)	1-3 lb	4	0	OMRI-listed ² .
	--	M-Pede 49% EC Soap, insecticidal	1-2% V/V	12	0	OMRI-listed ² .
Caterpillars; armyworms, webworms, cutworms, loopers, corn earworms	1A	*Lannate LV; *SP (methomyl)	LV: 1.5-3.0 pt SP: 0.5-1.0 lb	48	6	Do not make more than 10 applications per crop or apply more than 15 pt (LV) or 5 lb (SP) per acre per crop.
	1A	Sevin XLR, 4F; 80 S (carbaryl)	XLR, 4F: 0.5-2.0 qt 80S: 0.63-2.5 lb	12	7	Do not apply more than a total of 6 qt (4F, XLR) or 7.5 lb (80S).
	3A	*Asana XL (0.66 EC) (esfenvalerate)	2.9-9.6 fl oz	12	7	Do not apply more than 0.35 lb ai/acre per season (7 applications at highest rate).
	3A	*Baythroid XL (beta-cyfluthrin)	0.8-2.8 fl oz	12	0	Allow at least 5 days between applications. A maximum of 16.8 fl oz may be applied per acre per season.
	3A	*Mustang (zeta-cypermethrin)	1.4-4.3 oz	12	1	A maximum of 0.3 lb ai/acre per season may be applied.
	3A	*Pounce 25 WP (permethrin)	6.4-12.8 oz	12	14	Do not apply more than 0.8 lb ai/acre per season.
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5-18.0 fl oz	12	0	Harmful to bees. Degrades rapidly in sunlight. Good coverage essential. OMRI-listed ² .
	3A	*Warrior II (lambda-cyhalothrin)	0.96-1.92 fl oz	24	7	Only exposed insects can be controlled. Do not apply more than 7.68 fl oz of product per acre per season.
	5	Entrust SC (spinosad)	3-10 fl oz	4	7	Do not apply to consecutive generations of Colorado potato beetle. Do not apply more 21 fl oz per acre per season or more than 4 times/crop. OMRI-listed.
	5	Radiant SC (spinetoram)	4.5-8 fl oz	4	7	No more than 4 applications per year.
	11A	DiPel DF (<i>Bacillus thuringiensis</i> subspecies kurstaki)	0.5-2.0 lb	4	0	Treat when larvae are young. Good coverage is essential. For organic production.
	11A	Xentari DF (<i>Bacillus thuringiensis</i> subspecies aizawai)	0.5-2.0 lb	4	0	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. Can be used in organic production.
	28,6	Minecto Pro (cyantraniliprole, abamectin)	5.5-10 fl oz/A	12	7	Must add an adjuvant. Check label for use requirements.
	15	Rimon 0.83EC (novaluron)	6-12 fl oz	12	14	Do not apply more than 24 oz per acre per season. Does not affect adult insects.
22	Avaunt eVo (indoxacarb)	2.5-3.5 oz/A	12	3		
22	Avaunt 30WG (indoxacarb)	2.5-6.0 oz/A	12	7	Do not apply more than 24 oz/acre per crop.	

Table 14.3. Insecticides labeled for management of arthropod pests of potato. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.
Also refer to Table 19.1 for biopesticide and other alternative products labeled for disease management.

Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
	28	Exirel (cyazapyr)	10-17 fl oz/A	12	1	Do not apply more than 0.4 lb ai/acre of cyazapyr or cyantraniliprole containing products per crop whether applications are made to foliage or soil. See label for diamondback moth resistance management.
	28	Coragen (rynaxypyr)	3.5-7.5 fl oz	4	14	Do not apply more than 15.4 fl oz per acre per crop per season. Foliar or overhead sprinkler irrigation systems only.
	28,6	Minecto Pro (cyantraniliprole, abamectin)	5.5-10 fl oz/A	12	7	Must add an adjuvant. Check label for use requirements.
	--	Neemix 4.5 (azadirachtin)	4-16 fl oz	12	0	Insect growth regulator and anti-feedant. OMRI-listed ² .
	--	Grandevo (<i>Chromobacterium subsugae</i> strain PRAA4-1)	1-3 lb	4	0	OMRI-listed ² .
European corn borer	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5-18.0 fl oz	12	0	Harmful to bees. Degrades rapidly in sunlight. Good coverage essential. OMRI-listed ² .
	5	Radiant SC (spinetoram)	4.5-8 fl oz	4	7	No more than 4 applications per year.
	22	Avaunt eVo (indoxacarb)	2.5-3.5 oz/A	12	3	
	22	Avaunt 30WG (indoxacarb)	2.5-6.0 oz	12	7	Do not apply more than 24 oz/acre per crop.
	28	Exirel (cyazapyr)	5-20.5 fl oz/A (5-13.5 fl oz/A for CPB; 13.5-20.5 oz/A for flea beetles)	12	1	Do not apply more than 0.4 lb ai/acre of cyazapyr or cyantraniliprole containing products per crop whether applications are made to foliage or soil. See label for diamondback moth resistance management.
	28	Coragen (rynaxypyr)	3.5-7.5 fl oz	4	14	Do not apply more than 15.4 fl oz per acre per crop per season. Foliar or overhead sprinkler irrigation systems only.
Beetles: blister beetles, flea beetles, Colorado potato beetles, cucumber beetles, whitefringed beetles	1A	*Lannate LV; *SP (methomyl)	LV: 1.5-3.0 pt SP: 0.5-1.0 lb	48	6	Do not make more than 10 applications per crop or apply more than 15 pt (LV) or 5 lb (SP) per acre per crop.
	1A	Sevin XLR, 4F; 80 S (carbaryl)	XLR, 4F: 0.5-2.0 qt 80S: 0.63-2.5 lb	12	7	Do not apply more than a total of 6 qt (4F, XLR) or 7.5 lb (80S).
	1B	Imidan 70 W (phosmet)	1.3 lb	5 days	7	Use only on potatoes to be harvested by machine. Do not apply where bees are foraging.
	1B	*Thimet 20 G (phorate)	See label - varies with soil type and time of application.	48	90	One application per season.
	3A	*Ambush 25W (permethrin)	3.2-12.8 oz	12	14	Do not apply more than 1.6 lb active ingredient per season (102.4 oz).
	3A	*Asana XL (0.66 EC) (esfenvalerate)	2.9-9.6 fl oz	12	7	Do not apply more than 0.35 lb ai/acre per season (7 applications at highest rate).
	3A	*Baythroid XL (beta-cyfluthrin)	0.8-2.8 fl oz	12	0	Allow at least 5 days between applications. A maximum of 16.8 fl oz may be applied per acre per season.
	3A	Aza-Direct (azadirachtin)	1-2 pts, up to 3.5 pts, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
	3A	*Brigade 2 EC (bifenthrin)	soil: 9.6-19.2 oz at-plant and 3.2-9.6 oz at lay-by foliar: 2.1-6.4 oz	12	21	No more than 2 foliar applications, at least 21 days apart. Do not apply more than 0.5 lb active ingredient per acre per season, including soil applications.
	3A	*Mustang (zeta-cypermethrin)	1.4-4.3 oz	12	1	A maximum of 0.3 lb ai/acre per season may be applied.
	3A	*Pounce 25 WP (permethrin)	6.4-12.8 oz	12	14	Do not apply more than 0.8 lb ai/acre per season.
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5-18.0 fl oz	12	0	Harmful to bees. Degrades rapidly in sunlight. Good coverage essential. OMRI-listed ² .
	3A	*Warrior II (lambda-cyhalothrin)	0.96-1.92 fl oz	24	7	Only exposed insects can be controlled. Do not apply more than 7.68 fl oz of product per acre per season.

Table 14.3. Insecticides labeled for management of arthropod pests of potato. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.
Also refer to Table 19.1 for biopesticide and other alternative products labeled for disease management.

Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
	3A, 4A	*Endigo ZC (lambda-cyhalothrin, thiamethoxam)	3.5-4.5 fl oz	24	14	Do not exceed a total of 10 fl oz of product per acre per growing season. Do not use with other Group 4A insecticides.
	3A, 28	*Besiege (lambda-cyhalothrin, chlorantraniliprole)	5-9 oz	24	14	Do not apply more than 27.0 fl. oz of product per acre per season.
	4A	Actara (thiamethoxam)	1.5-3.0 oz	12	14	Toxic to bees. Do not use following soil application of other Group 4A insecticides. Maximum 6 oz/acre per season.
	4A	Admire Pro (imidacloprid)	soil: 5.7-8.7 fl oz seed piece: 3.5-7.0 fl oz/100 lb seed foliar: 1.3 fl oz	12	at planting, see label for options; foliar: 7	Do not apply more than, 0.31 lb ai per acre per season. Seed piece rate is based on seeding rate of 2000 lb/acre. Foliar: Maximum for foliar applications per year: 5.6 fl oz.
	4A	Assail 30SG (acetamiprid)	1.5-4.0 oz	12	7	Do not make more than 4 applications per season. Do not exceed a total of 0.3 lb ai (16 oz of product) per acre per season.
	4A	Belay Insecticide (clothianidin)	in-furrow or side dress: 9-12 fl oz foliar: 2-3 fl oz	12	Foliar: 14, or at planting or sidedress or spray at ground crack over row at hilling	See label for in-furrow, side dress and seed-piece applications. Do not apply during bloom or allow to drift to flowering plants. Toxic to bees for five days after application.
	4A	Platinum 75SG (thiamethoxam)	1.66-2.67 oz	12	applied at planting or at plant emergence	To manage resistance, avoid using other Group 4A insecticides in conjunction with Platinum. One soil application per year.
	4A	Scorpion 35SL (dinotefuran)	foliar: 2-2.75 fl oz soil: 11.5-13.25 fl oz	12	foliar: 7 soil: see label	Apply as foliar or soil application, but not both. Maximum per acre per season for foliar use: 8 fl oz. Maximum when applied to soil=13.25 fl. oz. Do not apply where bees are foraging. Toxic to bees for 38 hours after application.
	4A	Venom Insecticide (dinotefuran)	foliar: 1-1.5 oz soil: 6.5-7.5 oz	12	foliar: 7 soil: at planting	Do not apply more than 4.5 oz per acre per season to foliage. One soil application, either preplant, preemergence, or at ground crack. Do not use with other Group 4A insecticides. Do not apply where bees are foraging. Toxic to bees for 38 hours after application.
	4A, 28	Voliam Flexi (thiamethoxam, chlorantraniliprole)	4 oz	12	14	No more than two applications.
	4D	Sivanto Prime (flupyradifurone)	7-14 fl oz	4	7	Minimum interval between applications=7 days. Maximum amount per year=28 fl oz/acre.
	5	Entrust SC (spinosad)	3-10 fl oz	4	7	Do not apply to consecutive generations of Colorado potato beetle. Do not apply more 21 fl oz per acre per season or more than 4 times/crop. OMRI-listed ² .
	5	Radiant SC (spinetoram)	4.5-8 fl oz	4	7	No more than 4 applications per year.
	15	Rimon 0.83EC (novaluron)	6-12 fl oz	12	14	Do not apply more than 24 oz per acre per season. Does not affect adult insects.
	17	Trigard (cyromazine)	2.66-5.32 oz	12	7	Most effective for control of 1 st and 2 nd instar larvae. Does not control adult CPB. Use lower rate for leafminers. Maximum per acre per season: 1.0 lb.
	22	Avaunt (indoxacarb)	2.5-6.0 oz	12	7	Do not apply more than 24 oz/acre per crop.
	28	Coragen (rynaxypyr)	3.5-5.0 fl oz	4	14	Do not apply more than 15.4 fl oz per acre per crop per season. Foliar or overhead sprinkler irrigation systems only.
	28	Verimark (cyazapyr)	6.75-13.5 fl oz	4	N/A-applied at planting	Do not apply more than 13.5 fl oz per acre at planting. pH of application solution must be between 4 and 6.
	--	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed ² . Antifeedant, repellent, insect growth regulator.
	--	Kryocide (cryolite)	10-12 lb	12	0	Application to exposed tubers may result in excess residues.

Table 14.3. Insecticides labeled for management of arthropod pests of potato. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.
Also refer to Table 19.1 for biopesticide and other alternative products labeled for disease management.

Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
	–	Suffoil-X (mineral oil)	1-2% v/v	4	0	OMRI-listed ² .
	--	M-Pede 49% EC (Soap, insecticidal)	1-2% V/V	12	0	OMRI-listed ² .
Fire ants	6	Clinch (abamectin)	1 lb	12	0	Apply when ants are actively foraging. Apply after dew or rainfall has dried for maximum effectiveness. Do not apply if rainfall is anticipated within 4-6 hours. No more than 4 applications per year.
	7A	Extinguish ((S)-methoprene)	1.0-1.5 lb	4	0	Slow-acting IGR (insect growth regulator). Best applied early spring and fall where crop will be grown. Colonies will be reduced after three weeks and eliminated after 8 to 10 weeks. May be applied by ground equipment or aerially.
Leafhoppers	1A	*Lannate LV; *SP (methomyl)	LV: 1.5-3.0 pt SP: 0.5-1.0 lb	48	6	Do not make more than 10 applications per crop or apply more than 15 pt (LV) or 5 lb (SP) per acre per crop.
	1A	Sevin XLR, 4F; 80 S (carbaryl)	XLR, 4F: 0.5-2.0 qt 80S: 0.63-2.5 lb	12	7	Do not apply more than a total of 6 qt (4F, XLR) or 7.5 lb (80S).
	1B	Dimethoate 4 EC (dimethoate)	0.5-1.0 pt	48	0 if mechanically harvested, 14 otherwise	Highly toxic to bees. Do not apply more than 2 pts per acre per year.
	1B	Imidan 70 W (phosmet)	1.3 lb	5 days	7	Use only on potatoes to be harvested by machine. Do not apply where bees are foraging.
	1B	Malathion 5EC, 8F (malathion)	5EC: 1.5-2.5 pt 8F: 1-1.5 pt	12	0	Maximum of two applications per year.
	1B	*Thimet 20 G (phorate)	See label - varies with soil type and time of application.	48	90	One application per season.
	3A	*Asana XL (0.66 EC) (esfenvalerate)	2.9-9.6 fl oz	12	7	Do not apply more than 0.35 lb ai/acre per season (7 applications at highest rate).
	--	Aza-Direct (azadirachtin)	1-2 pts, up to 3.5 pts, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
	3A	*Baythroid XL (beta-cyfluthrin)	0.8-2.8 fl oz	12	0	Allow at least 5 days between applications. A maximum of 16.8 fl oz may be applied per acre per season.
	3A	*Mustang (zeta-cypermethrin)	1.4-4.3 oz	12	1	A maximum of 0.3 lb ai/acre per season may be applied.
	3A	*Pounce 25 WP (permethrin)	6.4-12.8 oz	12	14	Do not apply more than 0.8 lb ai/acre per season.
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5-18.0 fl oz	12	0	Harmful to bees. Degrades rapidly in sunlight. Good coverage essential. OMRI-listed ² .
	3A	*Warrior II (lambda-cyhalothrin)	0.96-1.92 fl oz	24	7	Only exposed insects can be controlled. Do not apply more than 7.68 fl oz of product per acre per season.
	3A, 28	*Besiege (lambda-cyhalothrin, chlorantraniliprole)	5-9 oz	24	14	Do not apply more than 27.0 fl. oz of product per acre per season.
	3A, 4A	*Endigo ZC (lambda-cyhalothrin, thiamethoxam)	3.5-4.5 fl oz	24	14	Do not exceed a total of 10 fl oz of product per acre per growing season. Do not use with other Group 4A insecticides.
	4A	Admire Pro (imidacloprid)	5.7-8.7 fl oz as soil treatment or as seed piece treatment: 3.5-7.0 fl oz/100 lb seed foliar: 1.3 fl oz	12	at planting, see label for options; foliar: 7	Do not apply more than, 0.31 lb ai per acre per season. Seed piece rate is based on seeding rate of 2000 lb/acre. Foliar: Maximum for foliar applications per year: 5.6 fl oz.
	4A	Platinum 75SG (thiamethoxam)	1.66-2.67 oz	12	applied at planting or at plant emergence	To manage resistance, avoid using other Group 4A insecticides in conjunction with Platinum. One soil application per year.
	4A	Scorpion 35SL (dinotefuran)	foliar: 2-2.75 fl oz soil: 11.5-13.25 fl oz	12	foliar: 7 soil: see label	Apply as foliar or soil application, but not both. Maximum per acre per season for foliar use: 8 fl oz. Maximum when applied to soil=13.25 fl. oz. Do not apply where bees are foraging. Toxic to bees for 38 hours after application.
	4A	Venom Insecticide (dinotefuran)	foliar: 1-1.5 oz soil: 6.5-7.5 oz	12	foliar: 7 soil: at planting	Do not apply more than 4.5 oz per acre per season to foliage. One soil application, either preplant, preemergence, or at ground crack. Do not use with other Group 4A insecticides. Do not apply where bees are foraging. Toxic to bees for 38 hours after application.

Table 14.3. Insecticides labeled for management of arthropod pests of potato. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.
 Also refer to Table 19.1 for biopesticide and other alternative products labeled for disease management.

Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
	28, 6	Minecto Pro (cyantraniliprole, abamectin)	5.5 - 10 fl oz/A	12	7	Must add an adjuvant. Check label for use requirements.
	4A, 28	Voliam Flexi (thiamethoxam, chlorantraniliprole)	4 oz	12	14	No more than two applications.
	4C	Transform (sulfoxaflor)	0.75-2.25 oz	24	7	Bloom and tank mix restrictions apply.
	4D	Sivanto Prime (flupyradifurone)	7-14 fl oz	4	7	Minimum interval between applications=7 days. Maximum amount per year=28 fl oz/acre.
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed ² . Antifeedant, repellent, insect growth regulator.
	--	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.
	--	Grandevo (<i>Chromobacterium</i> <i>subtsugae</i> strain PRAA4-1)	1-3 lb	4	0	OMRI-listed ² .
	--	M-Pede 49% EC (Soap, insecticidal)	1-2% V/V	12	0	OMRI-listed ² .
	--	Sun Spray 98.8%, JMS Stylet-Oil, others (oil, insecticidal)	3-6 qt/100 gal (JMS)	4	0	See label for tank mix cautions. Organic Stylet-Oil is OMRI-listed ² .
Leafminer	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5-18.0 fl oz	12	0	Harmful to bees. Degrades rapidly in sunlight. Good coverage essential. OMRI-listed ² .
	5	Entrust SC (spinosad)	3-10 fl oz	4	7	Do not apply to consecutive generations of Colorado potato beetle. Do not apply more 21 fl oz per acre per season or more than 4 times/crop. OMRI-listed ² .
	5	Radiant SC (spinetoram)	4.5-8 fl oz	4	7	No more than 4 applications per year.
	6	*Agri-Mek SC (abamectin)	1.75-3.5 fl oz	12	14	No more than 2 sequential applications. Must be applied with non-ionic activator type wetting, spreading, or penetrating adjuvant. See label for resistance management.
	17	Trigard (cyromazine)	2.66-5.32 oz	12	7	Most effective for control of 1 st and 2 nd instar larvae. Does not control adult CPB. Use lower rate for leafminers. Maximum per acre per season: 1.0 lb.
	28	Coragen (rynaxypyr)	3.5-5.0 fl oz	4	14	Do not apply more than 15.4 fl oz per acre per crop per season. Foliar or overhead sprinkler irrigation systems only.
	-	Suffoil-X (mineral oil)	1-2% v/v	4	0	OMRI-listed ² .
	28,6	Minecto Pro (cyantraniliprole, abamectin)	5.5-10 fl oz/A	12	7	Must add an adjuvant. Check label for use requirements.
	-	Aza-Direct (azadirachtin)	1-2 pts, up to 3.5 pts, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
	-	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.
	-	Sun Spray 98.8%, JMS Stylet-Oil, others (oil, insecticidal)	3-6 qt/100 gal (JMS)	4	0	See label for tank mix cautions. Organic Stylet-Oil is OMRI-listed ² .
Mites	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5-18.0 fl oz	12	0	Harmful to bees. Degrades rapidly in sunlight. Good coverage essential. OMRI-listed ² .
	6	*Agri-Mek SC (abamectin)	1.75-3.5 fl oz	12	14	No more than 2 sequential applications. Must be applied with non-ionic activator type wetting, spreading, or penetrating adjuvant. See label for resistance management.
	23	Oberon 2SC (spiromesifen)	8-16 fl oz	12	7	Maximum amount per crop: 32.0 fl oz/acre. Maximum applications: 2.

Table 14.3. Insecticides labeled for management of arthropod pests of potato. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical. Also refer to Table 19.1 for biopesticide and other alternative products labeled for disease management.

Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
	--	Trilogy (extract of neem oil)	1.0%-2.0% V/V	4	0	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed ² .
	--	Aza-Direct (azadirachtin)	1-2 pts, up to 3.5 pts, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
	--	M-Pede 49% EC Soap, insecticidal	1-2% V/V	12	0	OMRI-listed ² .
	--	Sun Spray 98.8%, JMS Stylet-Oil, others (oil, insecticidal)	3-6 qt/100 gal (JMS)	4	0	See label for tank mix cautions. Organic Stylet-Oil is OMRI-listed ² .
Leaf-footed bugs, plant bugs, stink bugs, mealybugs, false chinch bugs	1A	Sevin XLR, 4F; 80 S (carbaryl)	XLR, 4F: 0.5-2.0 qt 80S: 0.63-2.5 lb	12	7	Do not apply more than a total of 6 qt (4F, XLR) or 7.5 lb (80S).
	1B	Malathion 5EC, 8F (malathion)	5EC: 1.5-2.5 pt 8F: 1-1.5 pt	12	0	Maximum of two applications per year.
	3A	*Asana XL (0.66 EC) (esfenvalerate)	2.9-9.6 fl oz	12	7	Do not apply more than 0.35 lb ai/acre per season (7 applications at highest rate).
	3A	Aza-Direct (azadirachtin)	1-2 pts, up to 3.5 pts, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
	3A	*Baythroid XL (beta-cyfluthrin)	0.8-2.8 fl oz	12	0	Allow at least 5 days between applications. A maximum of 16.8 fl oz may be applied per acre per season.
	3A	*Mustang (zeta-cypermethrin)		12	1	A maximum of 0.3 lb ai/acre per season may be applied.
	3A	*Pounce 25 WP (permethrin)	6.4-12.8 oz	12	14	Do not apply more than 0.8 lb ai/acre per season.
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5-18.0 fl oz	12	0	Harmful to bees. Degrades rapidly in sunlight. Good coverage essential. OMRI-listed ² .
	3A	*Warrior II (lambda-cyhalothrin)	0.96-1.92 fl oz	24	7	Only exposed insects can be controlled. Do not apply more than 7.68 fl oz of product per acre per season.
	4A	Actara (thiamethoxam)	1.5-3.0 oz	12	14	Toxic to bees. Do not use following soil application of other Group 4A insecticides. Maximum 6 oz/acre per season.
	3A, 28	*Besiege (lambda-cyhalothrin, chlorantraniliprole)	5-9 oz	24	14	Do not apply more than 27.0 fl. oz of product per acre per season.
	3A, 4A	*Endigo ZC (lambda-cyhalothrin, thiamethoxam)	3.5-4.5 fl oz	24	14	Do not exceed a total of 10 fl oz of product per acre per growing season. Do not use with other Group 4A insecticides.
	29	Beleaf 50 SG (flonicamid)	2.0-2.8 oz	12	7	Begin applications before pest populations reach damaging levels. Do not apply more than 8.4 oz/acre per season.
	--	M-Pede 49% EC (Soap, insecticidal)	1-2% V/V	12	0	OMRI-listed ² .
Potato tuberworm	1A	*Lannate LV; *SP (methomyl)	LV: 1.5-3.0 pt SP: 0.5-1.0 lb	48	6	Do not make more than 10 applications per crop or apply more than 15 pt (LV) or 5 lb (SP) per acre per crop.
	3A	*Ambush 25W (permethrin)	3.2-12.8 oz	12	14	Do not apply more than 1.6 lb active ingredient per season (102.4 oz).
	3A	*Asana XL (0.66 EC) (esfenvalerate)	2.9-9.6 fl oz	12	7	Do not apply more than 0.35 lb ai/acre per season (7 applications at highest rate).
	3A	*Baythroid XL (beta-cyfluthrin)	0.8-2.8 fl oz	12	0	Allow at least 5 days between applications. A maximum of 16.8 fl oz may be applied per acre per season.
	3A	*Pounce 25 WP (permethrin)	6.4-12.8 oz	12	14	Do not apply more than 0.8 lb ai/acre per season.
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5-18.0 fl oz	12	0	Harmful to bees. Degrades rapidly in sunlight. Good coverage essential. OMRI-listed ² .
	3A, 28	*Besiege (lambda-cyhalothrin, chlorantraniliprole)	5-9 oz	24	14	Do not apply more than 27.0 fl. oz of product per acre per season.
	15	Rimon 0.83EC (novaluron)	6-12 fl oz	12	14	Do not apply more than 24 oz per acre per season. Does not affect adult insects.
	28	Coragen (rynaxypyr)	3.5-5.0 fl oz	4	14	Do not apply more than 15.4 fl oz per acre per crop per season. Foliar or overhead sprinkler irrigation systems only.

Table 14.3. Insecticides labeled for management of arthropod pests of potato. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical.
Also refer to Table 19.1 for biopesticide and other alternative products labeled for disease management.

Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
Thrips	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5-18.0 fl oz	12	0	Harmful to bees. Degrades rapidly in sunlight. Good coverage essential. OMRI-listed ² .
	5	Entrust SC (spinosad)	3-10 fl oz	4	7	Do not apply to consecutive generations of Colorado potato beetle. Do not apply more 21 fl oz per acre per season or more than 4 times/crop. OMRI-listed ² .
	5	Radiant SC (spinetoram)	4.5-8 fl oz	4	7	No more than 4 applications per year.
	-	Mycotrol ESO (<i>Beauveria bassiana</i> strain GHA)	0.25-1 quart per acre. Apply in sufficient water to cover foliage, typically 5-100 gallons per acre.	4	0	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Compatible as a tank mix with some fungicides.
	-	BotaniGard ES (<i>Beauveria bassiana</i> strain GHA)	0.25-1 quart per acre. Apply in sufficient water to cover foliage, typically 5-100 gallons per acre.	4	0	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Compatible as a tank mix with some fungicides.
	-	Molt-X (azadirachtin)	10 fl oz	4	0	OMRI-listed ² . Antifeedant, repellent, insect growth regulator.
	--	Aza-Direct (azadirachtin)	1-2 pts, up to 3.5 pts, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
	--	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.
	--	Trilogy (extract of neem oil)	1.0%-2.0% V/V	4	0	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed ² .
	--	M-Pede 49% EC (Soap, insecticidal)	1-2% V/V	12	0	OMRI-listed ² .
--	Sun Spray 98.8%, JMS Stylet-Oil, others (oil, insecticidal)	3-6 qt/100 gal (JMS)	4	0	See label for tank mix cautions. Organic Stylet-Oil is OMRI-listed ² .	
Whiteflies	4A	Actara (thiamethoxam)	1.5-3.0 oz	12	14	Toxic to bees. Do not use following soil application of other Group 4A insecticides. Maximum 6 oz/acre per season.
	4A	Admire Pro (imidacloprid)	soil: 5.7-8.7 fl oz seed piece treatment: 3.5-7.0 fl oz/100 lb seed foliar: 1.3 fl oz	12	at planting, see label for options; foliar: 7	Do not apply more than 0.31 lb ai per acre per season. Seed piece rate is based on seeding rate of 2000 lb/acre. Foliar: Maximum for foliar applications per year: 5.6 fl oz.
	4A	Assail 30SG (acetamiprid)	1.5-4.0 oz	12	7	Do not make more than 4 applications per season. Do not exceed a total of 0.3 lb ai (16 oz of product) per acre per season.
	4A	Belay Insecticide (clothianidin)	in furrow or side dress: 9-12 fl oz foliar: 2-3 fl oz	12	Foliar: 14, or at planting or sidedress or spray at ground crack over row at hilling	See label for in-furrow, side dress and seed-piece applications. Do not apply during bloom or allow to drift to flowering plants. Toxic to bees for five days after application.
	4A	Platinum 75SG (thiamethoxam)	1.66-2.67 oz	12	applied at planting or at plant emergence	To manage resistance, avoid using other Group 4A insecticides in conjunction with Platinum. One soil application per year.
	4A	Venom Insecticide (dinotefuran)	foliar: 1-1.5 oz soil: 6.5-7.5 oz	12	foliar - 7 soil - at planting	Do not apply more than 4.5 oz per acre per season to foliage. One soil application, either preplant, preemergence, or at ground crack. Do not use with other Group 4A insecticides. Do not apply where bees are foraging. Toxic to bees for 38 hours after application.
	4C	Transform (sulfoxaflor)	0.75-2.25 oz	24	7	Bloom and tank mix restrictions apply.
	4D	Sivanto Prime (flupyradifurone)	7-14 fl oz	4	7	Minimum interval between applications=7 days. Maximum amount per year=28 fl oz/acre.
	9B	Fulfill (pymetrozine)	2.75-5.5 oz	12	14	Apply when whiteflies first appear. Do not exceed 11.0 oz per acre per season.
	15	Rimon 0.83EC (novaluron)	6-12 fl oz	12	14	Do not apply more than 24 oz per acre per season. Does not affect adult insects.

Table 14.3. Insecticides labeled for management of arthropod pests of potato. (continued)

Labels change frequently. Be sure to read a current product label before applying any chemical. Also refer to Table 19.1 for biopesticide and other alternative products labeled for disease management.

Insect or mite pest	MOA Code ¹	Trade Name Active Ingredient	Rate (Product/acre)	REI (hours)	Days to Harvest	Remarks ²
	23	Movento (spirotetramat)	4.0-5.0 fl oz	24	7	Maximum of 10 fl oz/acre per season.
	23	Oberon 2SC (spiromesifen)	8-16 fl oz	12	7	Maximum amount per crop: 32.0 fl oz/acre. Maximum applications: 2.
	--	Aza-Direct (azadirachtin)	1-2 pts, up to 3.5 pts, if needed	4	0	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
	--	Azatin XL (azadirachtin)	5-21 fl oz	4	0	Antifeedant, repellent, insect growth regulator.
	--	Neemix 4.5 (azadirachtin)	4-16 fl oz	12	0	Insect growth regulator and anti-feedant. OMRI-listed ² .
	--	Trilogy (extract of neem oil)	1.0%-2.0% V/V	4	0	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed ² .
	--	Grandevo (<i>Chromobacterium subtsugae</i> strain PRAA4-1)	1-3 lb	4	0	OMRI-listed ² .
	28,6	Minecto Pro (cyantraniliprole, abamectin)	10 fl oz/A	12	7	Must add an adjuvant. Check label for use requirements.
	--	Sun Spray 98.8%, JMS Stylet-Oil, others (oil, insecticidal)	3-6 qt/100 gal (JMS)	4	0	See label for tank mix cautions. Organic Stylet-Oil is OMRI-listed ² .
Wireworms	1B	*Mocap 15 G, *EC (ethoprop)	See labels	48	preplant or at planting	Use broadcast application for moderate to heavy infestations of wireworms.
	1B	*Thimet 20 G (phorate)	See label - varies with soil type and time of application.	48	90	One application per season.
	2B	*Regent 4SC (fipronil)	3.2 fl oz	0	90	Many plant-back restrictions. One in-furrow application at time of planting only. Must be incorporated and covered with soil.
	3	Capture LFR (bifenthrin)	25.5 fl oz			In furrow at planting
	3A	*Brigade 2 EC (bifenthrin)	9.6-19.2 oz at-plant (soil); 3.2-9.6 oz at lay-by (soil)	12	21	Do not apply more than 0.5 lb active ingredient per acre per season, including soil applications.
	4A	Admire Pro (imidacloprid)	5.7-8.7 fl oz as soil treatment or as seed piece treatment: 3.5-7.0 fl oz/100 lb seed foliar: 1.3 fl oz	12	at planting, see label for options;	Do not apply more than, 0.31 lb ai per acre per season. Seed piece rate is based on seeding rate of 2000 lb/acre. Foliar: Maximum for foliar applications per year: 5.6 fl oz.
	4A	Belay Insecticide (clothianidin)	9-12 fl oz (in-furrow or side dress application)	12	Foliar: 14, or at planting or sidedress or spray at ground crack over row at hilling	See label for in-furrow, side dress and seed-piece applications.
	4A	Platinum 75SG (thiamethoxam)	1.66-2.67 oz	12	applied at planting or at plant emergence	To manage resistance, avoid using other Group 4A insecticides in conjunction with Platinum. One soil application per year. For wireworms: seed-piece only.

¹ Mode of Action (MOA) codes for plant pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v. 8.2, March 2017. Number codes (1 through 29) are used to distinguish the main insecticide mode of action groups, with additional letters for certain sub-groups within each main group. All insecticides within the same group (with same number) indicate same active ingredient or similar mode of action. This information must be considered for the insecticide resistance management decisions. - = unknown, or a mode of action that has not been classified yet.

² Information provided in this table applies only to Florida. Be sure to read a current product label before applying any product. The use of brand names and any mention or listing of commercial products or services in the publication does not imply endorsement by the University of Florida Cooperative Extension Service nor discrimination against similar products or services not mentioned. OMRI listed: Listed by the Organic Materials Review Institute for use in organic production.

* **Restricted use insecticide.**

Table 14.4. Potato fungicides ordered by disease and then FRAC group according to their mode of action.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²	
			Applic.	Season	Harvest	Reentry		
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.								
Botrytis gray mold	M3	(mancozeb) Many brands available: Dithane M45, Dithane DF Rainshield, Dithane F45 Rainshield, Fortuna 75WDG, Koverall, Mancozeb Flowable, Manzate Pro-Stick, Nubark Mancozeb, Penncozeb 4FL, Penncozeb 80WP, Penncozeb 75DF, Roper DF Rainshield	SEE INDIVIDUAL LABELS		3	1		
	M5	(chlorothalonil) Many brands available: Bravo Ultrex, Bravo ZN, Bravo Weather Stik 6L, Chloronil 720, Chlorothalonil 720SC, Echo 90DF, Echo 720, Echo ZN, Equus DF, Equus 500 ZN, Equus 720SST, Initiate 720, Initiate ZN, Orondis Opti B	SEE INDIVIDUAL LABELS		7	0.5		
	(suppression)	M3 & M5	Elixir (mancozeb; chlorothalonil)	2 lb	18 lb	7	24 hr	
		3	Quash (metconazole)	2.5 oz	7.5 oz	1	12 hr	Follow resistance management recommendations on label
		7	Vertisan (penthiopyrad)	24 fl oz	72 fl oz	7	0.5	Do not make more than 2 sequential applications
		7	Endura 70WP (boscalid)	10 oz	20 oz	10	0.5	Do not make more than 4 apps at low rate or 2 apps at high rate
		7	Luna Privilege, Velum Prime (fluopyram)	See label for ground or aerial application rates	See label for ground or aerial application rates	7	12 hr	Do not make more than 2 sequential applications
	(suppression)	7 & 9	Luna Tranquility (fluopyram + pyrimethanil)	11.2 fl oz	43.6	7	0.5	Do not make more than 2 sequential applications
		7 & 11	Priaxor	8 fl oz	24	7	0.5	Do not make more than 2 sequential applications
		M5 & U15	Orondis Opti (chlorothalonil + oxathiapiprolin)	2.5 pt	10 pt per A per year	7	12 hr	See label
	9	Scala SC (pyrimethanil)	7 fl. oz	35 fl. oz	7	0.5	Use only in a tank mix with labeled fungicide for early blight	
(suppression)	11 & 4	Quadris Ridomil Gold (azoxystrobin + mefenoxam)	0.82 fl oz./ 1000 ft. of row	See label		0	Apply at planting	
Early blight (<i>Alternaria solani</i>)	M1	(copper compounds) Many brands available: Americop, Badge SC, Badge X2, Basic Copper 53, COC DF, COC WP, COCS WDG, Champ DP Dry Prill, Champ 2 FL, Champ WG, Champion WP, Cuprofix Ultra 40 Disperss, Copper-Count-N, Cuprofix MZ Disperss, Copper sulfate crystals, Copper-Z 4/4, , Cueva, Kentan DF, Kocide 2000, Kocide DF, Kocide 3000, Nordox 75WG, Nu Cop 50WP, Nu-Cop 3L, Nu-Cop 50DF, Nu-Cop HB, Quimag Copper Sulfate Crystal	SEE INDIVIDUAL LABELS		Varies by product from 0 to 1 day	Varies by product from 4 hr to 2 days		
	M1 & M3	ManKocide 61.1DF (copper hydroxide + mancozeb)	5 lb	74.66 lb	3	2		
	M3	(mancozeb) Many brands available: Dithane M45, Dithane DF Rainshield, Dithane F45 Rainshield, Fortuna 75WDG, Koverall, Mancozeb Flowable, Manzate Pro-Stick, Nubark Mancozeb, Penncozeb 4FL, Penncozeb 80WP, Penncozeb 75DF, Roper DF Rainshield	SEE INDIVIDUAL LABELS		3	1	Limit is 11.2 lb of active ingredient per a crop.	

Table 14.4. Potato fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²
			Applic.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.							
	M3	Polyram 80DF (metiram)	2 lb	14 lb	3	1	Limit is 7 appl./season
	M3 & M5	Elixir (mancozeb; chlorothalonil)	2 lb	18 lb	7	24 hr	
	M5 & 49	Orondis Opti (chlorothalonil + oxathiapiprolin)	2.5 pt	10 pt per A per year	7	12 hr	See label
	M5	(chlorothalonil) Many brands available: Bravo Ultrex, Bravo ZN, Bravo Weather Stik 6L, Chloronil 720, Chlorothalonil 720SC, Echo 90DF, Echo 720, Echo ZN, Equus DF, Equus 500 ZN, Equus 720SST, Initiate 720, Initiate ZN, Orondis Opti B	SEE INDIVIDUAL LABELS		7	0.5	Read label for application directions
	2	Enclosure 4 Iprodione 4L Nevado 4F Rovral 4F (iprodione)	2 pt	8 pt	14	1	Limit is 4 appl./crop. See individual label for additional information.
	3	Quash (metconazole)	2.5 oz	7.5 oz	1	12 hr	Follow resistance management recommendations on label
	4 & M3	Ridomil Gold MZ (mancozeb + mefenoxam)	2.5 lb	See label	3	2	Also labeled for storage rots (Pink Rot and Leak)
	4 & M5	Ridomil Gold Bravo SC (chlorothalonil + mefenoxam)	2.5 pt	See label	14	2	Limit is 4 appl./crop. Also labeled for storage rots (Pink Rot and Leak)
	7	Endura 70WP (boscalid)	10 oz	20 oz	10	0.5	Do not make more than 4 apps at low rate or 2 apps at high rate
	7	Vertisan (penthiopyrad)	24 fl oz	72 fl oz	7	0.5	Do not make more than 2 sequential applications
	7	Luna Privilege (fluopyram)	See label for ground or aerial application rates	See label for ground or aerial application rates	7	12 hr	Do not make more than 2 sequential applications
	7 & 9	Luna Tranquility (Fluopyram; pyrimethanil)	11.2 fl oz	43.6	7	0.5	Do not make more than 2 sequential applications
	7 & 11	Priaxor (fluxapyroxad + pyraclostrobin)	8 fl oz	24	7	0.5	Do not make more than 2 sequential applications
	9	Scala SC (pyrimethanil)	7 fl. oz	35 fl. oz	7	0.5	Use only in a tank mix with labeled fungicide for early blight
	11	Evito 480SC Aftershock (fluoxastrobin)	3.8 fl oz	22.8 fl oz	7	0.5	Limit is 6 application per crop and alternate with non-group 11 chemistry
	11	Gem 500SC (trifloxystrobin)	3.8 fl oz	23 fl. oz	7	0.5	Limit is 6 application per crop and alternate with non-group 11 chemistry
	11	Headline 2.09F (pyraclostrobin)	12 fl oz	72 fl oz	3	0.5	Alternate with non-group 11 chemistry between applications.
	11	Reason 500SC (fenamidone)	8.2 fl oz	24.6 fl oz	14	0.5	Alternate with non-group 11 chemistry between applications
	11	Aframe, Azoxystar, Azoxystar, Equation, Satoria, Trevo, Quadris, Willowood Azoxy (azoxystrobin)	See individual labels				Alternate with non-group 11 chemistry between applications. See label for soilborne disease applications
	11 & M5	Quadris Opti (azoxystrobin + chlorothalonil)	1.6 pt	See label	14	0.5	Alternate with non-group 11 chemistry between applications
	11 & M3	Cabrio Plus (pyraclostrobin + metiram)	2.9 lb	17.4 lb	3	1	Do not make more than two sequential applications
	11 & M3	Quadris Top (azoxystrobin & difenoconazole)	14 fl oz.	55.3 fl oz	14	0.5	Do not make more than 2 consecutive applications before switching to another effective fungicide with a different mode of action

Table 14.4. Potato fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²
			Applic.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.							
	19	OSO 5%SC (polyoxin D zinc salt)	13 fl oz	78 fl oz	0	4 hr	
	19	Ph-D (polyoxin D zinc salt)	6.2 oz	31 oz	0	0	Limit is 5 appl./season. Use in alternation with fungicides that have different modes of action.
	22 & M3	Gavel 75DF (mancozeb + zoxamide)	2.0 lb	12 lb	3	2	This product contains 66.7% mancozeb so do not exceed maximum allowed for mancozeb considering this and other mancozeb-containing products.
	22 & M5	Zing! (zoxamide + chlorothalonil)	34 fl oz/A	1.52 lb zoxamide and 8.8 lb chlorothalonil	7	12 hr	Do not make more than 2 consecutive applications before switching to another effective fungicide with a different mode of action
	27 & 11	Tanos (cymoxanil + famoxadone)	8 oz	48 oz	14	0.5	Do not make consecutive applications. Rotate to material with different mode of action
	27 & M5	Ariston (cymoxanil + chlorothalonil)	2 pt	17.5 pt cymoxanil and 11.25 lb a.i. chlorothalonil	14	12 hr	
	28	Previcur Flex (propamocarb hydrochloride)	1.2 pt	6.0 pt	14	0.5	Use with a tank mix. See label for seed piece treatment
	30	Agri-tin (triphenyltin hydroxide)	3.75 oz	11.5	7	2	
	30	Super-Tin 80WP (triphenyltin hydroxide)	6 fl oz	18	7	2	For use with closed tractor cabs only. Super Tin should be tank-mixed with another fungicide
	30	Super-Tin 80WP (triphenyltin hydroxide)	3.75 oz	11.25 oz	7	2	For use with closed tractor cabs only. Super Tin should be tank-mixed with another fungicide
	40 & 3	Revus Top (mandipropamid + difenoconazole)	7 fl. oz	28 fl oz.	14	0.5	Do not make more than 2 consecutive applications
Fusarium tuber rot	M3	(mancozeb) Many brands available: Dithane M45, Dithane DF Rainshield, Dithane F45 Rainshield, Fortuna 75WDG, Koverall, Mancozeb Flowable, Manzate Pro-Stick, Nubark Mancozeb, Penncozeb 4FL, Penncozeb 80WP, Penncozeb 75DF, Roper DF Rainshield	SEE INDIVIDUAL LABELS		3	1	See label for seed piece treatment.
	1	Mertect 340-F (thiabendazole)	0.42 fl oz per 2,000 lb of tuber		0.5		
	M3 & 25	Nubark Macozeb AS (mancozeb & streptomycin)	1 lb/100 seed pieces		1		Seed treatment
	27, M3 & 1	Evolve (cymoxanil + mancozeb + thiophanate-methyl)	0.75 lb/100 lb cut seed-pieces		1		Potato seed piece treatment

Table 14.4. Potato fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²
			Applic.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.							
Late blight (<i>Phytophthora infestans</i>)	M1	(copper compounds) Many brands available: Americop 40DF, Badge SC, Badge X2, Basic Copper 53, COC DF, COC WP, COCS WDG, Champ DP Dry Prill, Champ 2 FL, Champ WG, Champion WP, Cuprofix Ultra 40 Disperss, Copper-Count-N, Cuprofix MZ Disperss, Copper sulfate crystals, Copper-Z 4/4, , Cueva, Kentan DF, Kocide 2000, Kocide DF, Kocide 3000, Nordox 75WG, Nu Cop 50WP, Nu-Cop 3L, Nu-Cop 50DF, Nu-Cop HB, Quimag Copper Sulfate Crystal	SEE INDIVIDUAL LABELS		Varies by product from 0 to 1 day	Varies by product from 4 hr to 2 days	
	M1 & M3	ManKocide 61.1DF (copper hydroxide + mancozeb)	5 lb	74.66 lb	3	2	
	M3	(mancozeb) Many brands available: Dithane M45, Dithane DF Rainshield, Dithane F45 Rainshield, Fortuna 75WDG, Koverall, Mancozeb Flowable, Manzate Pro-Stick, Nubark Mancozeb, Penncozeb 4FL, Penncozeb 80WP, Penncozeb 75DF, Roper DF Rainshield	SEE INDIVIDUAL LABELS		3	1	Limit is 11.2 lb of active ingredient per a crop.
	M3	Polyram 80DF (metiram)	2 lb	14 lb	3	1	Limit is 7 appl./season
	M3 & M5	Elixir (mancozeb; chlorothalonil)	2 lb	18 lb	7	24 hr	
	M5	(chlorothalonil) Many brands available: Bravo Ultrex, Bravo ZN, Bravo Weather Stik 6L, Chloronil 720, Chlorothalonil 720SC, Echo 90DF, Echo 720, Echo ZN, Equus DF, Equus 500 ZN, Equus 720SST, Initiate 720, Initiate ZN, Orondis Opti B	SEE INDIVIDUAL LABELS		7	0.5	Read label for application directions
	4 & M1	Ridomil Gold Copper 64.8W (mefenoxam + copper hydroxide)	SEE INDIVIDUAL LABELS		14	2	Limit is 3 appl./crop of this product & other Ridomil products Add protectant fungicide, see label. Also for storage rots (Pythium leak Pink Rot)
	4 & M3	Ridomil Gold MZ (mancozeb + mefenoxam)	2.5 lb	See label	3	2	Also labeled for storage rots (Pink Rot and Leak)
	4 & M5	Ridomil Gold Bravo SC (chlorothalonil + mefenoxam)	2.5 pt	See label	14	2	Limit is 4 appl./crop. Also labeled for storage rots (Pink Rot and Leak)
	7 & 11	Priaxor (fluxapyroxad + pyraclostrobin)	8 fl oz	24	7	0.5	Do not make more than 2 sequential applications
	11	Evito 480SC, Aftershock (fluoxastrobin)	3.8 fl oz	22.8 fl oz	7	0.5	Limit is 6 application per crop and alternate with non-group 11 chemistry
	11	Gem 500SC (trifloxystrobin)	3.8 fl oz	23 fl. oz	7	0.5	Limit is 6 application per crop and alternate with non-group 11 chemistry
	11	Headline (pyraclostrobin)	12 fl oz	72 fl oz	3	0.5	Alternate with non-group 11 chemistry between applications.
	11	Reason 500SC (fenamidone)	8.2 fl oz	24.6 fl oz	14	0.5	Alternate with non-group 11 chemistry between applications
	11	Quadris, Aframe, Azoxystar, Azoxyzone, Equation, Satoria, Willowood Azoxy (azoxystrobin)	See individual labels				Alternate with non-group 11 chemistry between applications. See label for soilborne disease applications
	11 & M3	Cabrio plus (pyraclostrobin & metiram)	2.9 lb	17.4 lb	3	1	Do not make more than two sequential applications
	11 & M5	Quadris Opti (azoxystrobin + chlorothalonil)	1.6 pt	See label	14	0.5	Alternate with non-group 11 chemistry between applications

Table 14.4. Potato fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²	
			Applic.	Season	Harvest	Reentry		
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.								
Suppression only	19	OSO 5%SC (polyoxin D zinc salt)	13 fl oz	78 fl oz	0	4 hr		
	21	Ranman (cyazofamid)	2.75 fl oz	27.5 fl oz	7	0.5		
	22 & M3	Gavel 75DF (mancozeb + zoxamide)	2.0 lb	12 lb	3	2	This product contains 66.7% mancozeb so do not exceed maximum allowed for mancozeb considering this and other mancozeb-containing products.	
	22 & M5	Zing! (zoxamide + chlorothalonil)	34 fl oz/A	1.52 lb zoxamide and 8.8 lb chlorothalonil	7	12 hr	Do not make more than 2 consecutive applications before switching to another effective fungicide with a different mode of action	
	27	Curzate 60DF (cymoxanil)	3.2 oz	22.4 oz	14	0.5	Limit is 7 apps/year. Use in combination with a protectant fungicide. It is best to alternate Curzate with other fungicides such as mancozeb or chlorothalonil. Also labeled for seed treatment	
	27&M5	Ariston (cymoxanil + chlorothalonil)	2 pt	17.5 pt cymoxanil and 11.25 lb a.i. chlorothalonil	14	12 hr		
	27 & 11	Tanos (cymoxanil + famoxadone)	8 oz	48 oz	14	0.5	Do not make consecutive applications. Rotate to material with different mode of action	
	27, M3 & 1	Evolve (cymoxanil + mancozeb + thiophanate-methyl)	0.75 lb/100 lb cut seed-pieces			1	Potato seed piece treatment	
	28	Previcur Flex (propamocarb hydrochloride)	1.2 pt	6.0 pt	14	0.5	Use with a tank mix. See label for seed piece treatment	
	29	Omega 500F (fluazinam)	5.5 fl oz	3.5 pt	14	2	Rate is higher for white mold.	
	30	Agri-tin, Super-Tin (triphenyltin hydroxide)	See individual label		7	2		
	30	Super-Tin 80WP (triphenyltin hydroxide)	6 fl oz	18	7	2	For use with closed tractor cabs only. Super Tin should be tank-mixed with another fungicide	
	33	Alude, Confine Extra, K-Phite, Fosphite, Fungi-Phite, Phiticide, Phostrol, ProPhyt, Rampart, Reveille, (mono- and di-potassium salts of phosphorous acid)	See individual label					
	40	Forum (dimethomorph)	6 oz	30 oz	4	0.5	Tank mix with another chemistry. Do not make more than two sequential applications before alternating to a non-group 40 fungicide	
	40	Revus (mandipropamid)	8 fl. oz	32 fl oz	14	4 hr	Do not make more than 2 consecutive applications	
	40 & 3	Revus Top (mandipropamid + difenoconazole)	7 fl. oz	28 fl oz	14	0.5	Do not make more than 2 consecutive applications	
	(suppression)	43	Presido (fluopicolide)	4 fl oz	12 fl oz	7	0.5	Must be tank mixed
	45 & 40	Zampro (ametoctradin + dimethomorph)	14 fl oz.	42	4	12 hr	Do not make more than 2 consecutive applications	
	U15 & M5	Orondis Opti (oxathiapirolin +chlorothalonil)	2.5 pt	10 pt per A per year	7	12 hr	See label	

Table 14.4. Potato fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²
			Applic.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.							
	U15 & 40	Orondis Ultra (oxathiapiprolin + manipropamid)	8	32 fl oz per A per year	7		See label
Pythium, Pink Rot, and Phytophthora seed decays	4	Ridomil Gold SL, Orondis Gold B Ultra Flourish (mefenoxam)	SEE INDIVIDUAL LABELS			2	At planting
	4	MetaStar 2E AG (metalaxyl)	8 pt			2	See label for banding applications; for use at planting
	4 & M1	Ridomil Gold Copper 64.8W (mefenoxam + copper hydroxide)	2 lb	6 lb	14	2	Limit is 3 appl./crop of this product & other Ridomil products Add protectant fungicide, see label. Also for storage rots (Pythium leak, Pink Rot)
	4 & M3	Ridomil Gold MZ (mancozeb + mefenoxam)	2.5 lb	See label	3	2	Also labeled for storage rots (Pink Rot and Leak)
	4 & M5	Ridomil Gold Bravo SC (chlorothalonil + mefenoxam)	2.5 pt	See label	14	2	Limit is 4 appl./crop. Also labeled for storage rots (Pink Rot and Leak)
	14	Botran 75W (DCNA cicloran)	6 lb	10 lb	20	0.5	Subsequent applications are made at 2 lb/A
	14	Terraclor F (PCNB)	10.4 fl oz 1000 linear ft	15 pt	45	0.5	At planting or see label for white mold
	21	Ranman (cyazofamid)	2.75 fl oz	27.5 fl oz	7	0.5	Alternate with non-group 11 chemistry between applications
	27	Curzate 60DF (cymoxanil)	3.2 oz	22.4 oz	14	0.5	Limit is 7 apps/year. Use in combination with a protectant fungicide. It is best to alternate Curzate with other fungicides such as mancozeb or chlorothalonil. Also labeled for seed treatment
	M5 & 49	Orondis Opti (chlorothalonil + oxathiapiprolin)	2.5 pt	10 pt per A per year	7	12 hr	See label
	33	Alude, Confine Extra, K-Phite, Fosphite, Fungi-Phite, Phiticide, Phostrol, ProPhyt, Rampart, Reveille, (mono- and di-potassium salts of phosphorous acid)	See individual label				
Rhizoctonia, Black Scurf & Stem Canker (<i>Rhizoctonia solani</i>)	M3	(mancozeb) Many brands available: Dithane M45, Dithane DF Rainshield, Dithane F45 Rainshield, Fortuna 75WDG, Koverall, Mancozeb Flowable, Manzate Pro-Stick, Nubark Mancozeb, Penncozeb 4FL, Penncozeb 80WP, Penncozeb 75DF, Roper DF Rainshield	SEE INDIVIDUAL LABELS		3	1	See label for seed piece treatment.
	7	Moncut 70DF (flutolanil)	1.1 lb			0.5	In-furrow use only
	7	Vertisan (penthioopyrad)	24 fl oz	72 fl oz	7	0.5	Do not make more than 2 sequential applications
	7 & 3	Emesto Silver (penflufen; prothioconazole)	0.31 fl oz/ 100 lb seed pieces	0.93 fl oz		12 hr	See label for seed treatment details
	7 & M3	Moncoat MZ (flutolanil & mancozeb)	1.0 lb/ 100 lb seed			1	Seed treatment
	7 & 11	Elatus (azoxystrobin + benzovindiflupry)	5 oz/ 1000 linear feet		14		In-furrow use only
	11	Azoxystrobin 100ST, Azoyzone, Dynasty (azoxystrobin)	see label			4 hr	Seed treatment

Table 14.4. Potato fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²	
			Applic.	Season	Harvest	Reentry		
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.								
	11	Headline (pyraclostrobin)	0.8 fl oz/ 1000 linear ft			0.5	In-furrow use only	
	12	Dyna-Shield, Maxim, Spirato (fludioxonil)	0.8 fl oz/ 100 lb seed			0.5	Seed treatment	
	12 & M3	Maxim MZ (fludioxonil + mancozeb)	0.5 lb/ 100 lb seed			1	Seed treatment	
	14	Blocker 10G, Blocker 4F, Terraclor 75WP (PCNB)	See label				At planting	
	14	Terraclor F (PCNB)	10.4 fl oz 1000 linear ft	15 pt	45	0.5	At planting or see label for white mold	
	27, M3 & 1	Evolve (cymoxanil + mancozeb + thiophanate- methyl)	0.75 lb/ 100 lb cut seed- pieces			1	Potato seed piece treatment	
Soft rot	25	Agri-Mycin 17, Harbour (streptomycin)	100 ppm			0.5	Seed treatment. Check individual labels for specific rates and instructions	
Soilborne pathogens	M2	(mancozeb) Many brands available: Dithane M45, Dithane DF Rainshield, Dithane F45 Rainshield, Fortuna 75WDG, Koverall, Mancozeb Flowable, Manzate Pro-Stick, Nubark Mancozeb, Penncozeb 4FL, Penncozeb 80WP, Penncozeb 75DF, Roper DF Rainshield	SEE INDIVIDUAL LABELS			3	1	See label for seed piece treatment.
	11	Dynasty (azoxystrobin)	3.75 fl oz/ 100 lb seed				4 hr	For suppression of black scurf and stem canker and seed-borne black dot and for protection against silver scurf
	12	Maxim 4FS; Spirato (fludioxonil)	0.16 oz/ 100 lb seed				0.5	Seed treatment. Must be made using specific equipment.
	12	Maxim Potato Seed Protectant Maxim PSP (fludioxonil)	0.5 lb/ 100 lb seed				0.5	Seed treatment
	12 & M3	Maxim MZ (fludioxonil + mancozeb)	0.5 lb/100 lb seed				1	Seed treatment
White mold (Sclerotinia sclerotiorum)	1	Cercoban Topsin M WSB T-Methyl Thiophanate Methyl Incognito 4.5F (thiophanate-methyl)	SEE INDIVIDUAL LABELS			21	2	
	2	Enclosure 4, Iprodione 4L, Meteor, Nevado 4F, Meteor, Nevado 4F, Rovral 4F Rovral 4F (iprodione)	see label	see label	14		1	Limit is 4 appl./crop. See individual label for additional information.
	3	Quash (metconazole)	4.0 oz	7.5 oz	1		12 hr	Follow resistance management recommendations on label
(suppression)	7	Endura 70WP (boscalid)	10 oz	20 oz	10		0.5	Do not make more than 4 apps at low rate or 2 apps at high rate
	7	Vertisan (penthiopyrad)	24 fl oz	72 fl oz	7		0.5	Do not make more than 2 sequential applications

Table 14.4. Potato fungicides ordered by disease and then FRAC group according to their mode of action. (continued)

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (active ingredients)	Max. Rate/Acre		Min. Days to		Remarks ²
			Applic.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Refer to Table 19.2 for biopesticide and other alternative products labeled for disease management.							
	7	Luna Privilege, Velum Prime (fluopyram)	See label for ground or aerial application rates	See label for ground or aerial application rates	7	12 hr	Do not make more than 2 sequential applications
(suppression)	7 & 9	Luna Tranquility (fluopyram + pyrimethanil)	11.2 fl oz	43.6	7	0.5	Do not make more than 2 sequential applications
(suppression)	7 & 11	Priaxor (fluxapyroxad + pyraclostrobin)	8 fl oz	24	7	0.5	Do not make more than 2 sequential applications
	11	Headline (pyraclostrobin)	12 fl oz	72 fl oz	3	0.5	Alternate with non-group 11 chemistry between applications.
(suppression)	11 & M3	Cabrio plus (pyraclostrobin & metiram)	2.9 lb	17.4 lb	3	1	Do not make more than two sequential applications
	19	OSO 5%SC (polyoxin D zinc salt)	13 fl oz	78 fl oz	0	4 hr	

¹ FRAC code (fungicide group): Number (1 through 46) and letter s (U and P) are used to distinguish the fungicide mode of action groups. All fungicides within the same group (with same number or letter) indicate same active ingredient or similar mode of action. This information must be considered for the fungicide resistance management decisions. U = unknown, or a mode of action that has not been classified yet and is typically associated with another number; P = host plant defense inducers. Source: FRAC Code List 2018; <http://www.frac.info/> (FRAC = Fungicide Resistance Action Committee).

² Information provided in this table applies only to Florida. Be sure to read a current product label before applying any chemical. The use of brand names and any mention or listing of commercial products or services in the publication does not imply endorsement by the University of Florida Cooperative Extension Service nor discrimination against similar products or services not mentioned.

Table 14.5. Non-fumigant nematicides for potatoes in Florida.

Product	Broadcast or overall rates		Row rates	
	Per acre	Per 1000 sq ft	Per acre, 36" row spacing	Per 1000 ft. of row, any row spacing
Mocap 15G (a.i. ethoprop)	40 to 60 lb	0.9 to 1.4 lb	20 lb	1.4 lb
Mocap EC* (a.i ethoprop)	1 to 1.5 gal	2.9 to 4.4 fl oz	2 qt	4.4 fl oz
Vydate C-LV** (a.i oxamyl)	---	---	1 to 2 gal	9.8 to 19.5 oz
Nimitz (a.i fluensulfone)	All applications must be incorporated either physically or via drip or overhead irrigation. Make preplant applications at a rate of 3.5 to 7 pints, (56.0 to 80.0 fl. oz.) per acre, a minimum of seven days before planting. Do not plant any unlisted crops into treated land for 365 days after application of the product. Do not apply more than one application per crop, and no more than 112 fl. oz. of product per acre, per year (365 days). Provides control only for nematodes. Growers applying Nimitz must consult the product label to observe the plant-back (recropping) intervals for a variety of leafy vegetables and brassica crops, onions, bananas, sugarcane, and other crops.			
Velum (a.i. fluopyram)	Apply max 6.84 fl oz/acre using overhead chemigation equipment. Do not apply more than 13.7 fl oz of Velum (0.446 lbs Fluopyram) per acre per year, regardless of formulation (Velum and/or Luna) or method of application (soil or foliar). Do not apply within 7 days of harvest. For soil application, to limit the potential for development of disease resistance to this chemical class, the first foliar fungicide application after Velum should be a product from a different FRAC group.			

* Do not apply Mocap in furrow, as it can cause crop injury when in contact with the seed piece. Do not apply Mocap where sorghum will be grown during the same year, as its residual activity may cause serious injury to sorghum. Mix into the top 2 to 4 inches of soil. Do not exceed 9 lb ai/A Mocap 15G and 12 lb ai/A for Mocap EC.

** Vydate C-LV has registration for nematode suppression in potatoes as an in-furrow and foliar treatment program only. Each application of Vydate C-LV should be applied in a minimum of 20 gals of water per acre, the spray solution water always buffered to a pH of 5.0 or lower. Do not apply more than 2.4 gallons (9 lb a.i.) per acre per season, or make more than 8 applications of Vydate C-LV per crop, the last application at least 7 days prior to harvest.

Mocap and Vydate are insecticide/nematicides; Velum is a fungicide/nematicide; Nimitz is a true nematicide. Unlike fumigants, these products are not volatile and will move through the soil via water; depending on the water solubility, these products will have different recommendations as far as how to best apply them (see specific label recommendations); when nematode pressure is high, they may not be as consistently effective against root nematodes as the fumigants.

Table 14.6. Fumigant nematicides for potatoes in Florida.

Nematicide	Broadcast Application ¹		In the Row Applications
	Gallons or Lbs Per acre	Fl oz /1000 ft / chisel spaced 12" apart	
Telone II ^{2,3}	9 to 12 gal	26 to 35	For any row spacing, application rates given may be concentrated in the row, but shall never exceed the labeled maximum for broadcast applications. Consult the product label for additional detail.
Telone C-17 ^{2,3}	10.8 to 17.1 gal	31.8 to 50.2	For any row spacing, application rates given may be concentrated in the row, but shall never exceed the labeled maximum for broadcast applications. Consult the product label for additional detail.
Telone C-35 ^{2,3}	13 to 20.5	38.2 to 60.2	For any row spacing, application rates given may be concentrated in the row, but shall never exceed the labeled maximum for broadcast applications. Consult the product label for additional detail.
Pic-Clor 60	19 to 31.5	57 to 90	For any row spacing, application rates should never exceed the labeled maximum for broadcast applications. Consult the product label for additional detail.
Chloropicrin 99%	150-350 lb	-	For any row spacing, application rates should never exceed the labeled maximum for broadcast applications. Consult the product label for additional detail.
Vapam HL	75 gal	-	For drip or in-row chisel fumigation, consult product label for proportionately reduced overall rates, drip concentration and flow modifying directions and procedures.
KPam HL	60 gal	-	For drip or in-row chisel fumigation, consult product label for proportionately reduced overall rates, drip concentration and flow modifying directions.
Allyl isothiocyanate (AITC) Dominus	40 gal	-	For drip or in-row fumigation and crop termination, consult product label for proportionately reduced overall rates, drip concentration and flow modifying directions

^{*1} Gallons /acre and Fl oz / 1000 feet provided only for mineral soils. Higher rates may be possible for heavier textured (loam, silt, clay) or highly organic soils.

² All of the fumigants mentioned are for retail sale and use only by state certified applicators or persons under their direct supervision. New supplemental labeling for the Telone products must be in the hands of the user at the time of application. See new label details for additional use restrictions based on soil characteristics, buffer zones, requirements for Personal Protective Equipment (PPE), mandatory good agricultural practices (GAP's), applicator training certification, and other new rate modifying recommendations.

³ Higher application rates are possible in the presence of cyst-forming nematodes.

Rates are believed to be correct for products named, and similar products of other brand names, when applied to mineral soils. Higher rates are required for muck (organic) soils. However, the grower has the final responsibility to see that each product is used legally; **read the label** of the product to be sure that you are using it properly.

Table 14.7. Chemical desiccants for potato production.

Active Ingredient	Trade name	Product / A	PHI ¹	Relative Desc. Rate ²
Carfentrazone	Aim	3.2 - 5.8 fl. oz.	7 days	Fast
Diquat	Reglone	1.0 - 2.0 pt.	7 days	Fast
Glufosinate	Rely 280, Reckon 280 SL	21 fl. oz.	9 days	Slow
Pelargonic acid	Scythe	7 - 10% v/v	1 day	Fast
Pyraflufen	ET Herbicide/Defoliant	2.75 - 5.5 fl.oz.	14 days	Slow

¹ PHI = Preharvest Interval is the minimum time between application and harvest. It is not necessarily the time required to achieve tuber maturity and good skin-set.

² Relative dessication rate for each herbicide