2013 POTATO CROP

Weed and Pest Control Guide

Publication 1300A

Prince Edward Island

Prince Edward Island CANADA

Agriculture and Forestry

Prince Edward Island Department of Agriculture and Forestry

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ACUTE TOXICITY TABLE

Hazard Symbol	Hazard Rating	MAMMALS			FISH
		ORAL LD50 (mg/kg body wt)	INHALATION LD50 (mg/L of air)	DERMAL LD50 (mg/kg body wt)	RELATIVE RISK RANKING SCORE
VLH	Very Low Hazard	Above 500	Above 2	Above 2000	Above 8
LH	Low Hazard	101 - 500	0.41 - 2	401 - 2000	6 - 7.99
MH	Moderate Hazard	21 - 100	0.21 - 0.4	201 - 400	4 - 5.99
VHH	Very High Hazard	11 - 20	0.081 - 0.2	81 - 200	2 - 3.99
EH	Extremely	10 and less	0.08 and less	80 and less	1.99 and less

PESTICIDES ABBREVIATIONS

SU suspension
WP wettable powder
DU dust
FC flowable concentrate
kg kilogram
ha hectare
mL millilitres

SC spray concentrate
SN solution
SP soluble powder
DF dry flowable
g gram
L litre

DP dispersable powder
EC emulsifiable concentrate
GR granular
SURF surfactant
FLOW flowable liquid
EW water base

POTATO SEED PIECE TREATMENT

Product		Formulation	Product/ 100 Kg Seed	Hazard Rating Mammals
Fungcide				
Fludioxonil	Maxim PSP	0.5% DU	0.5 kg	VLH
Fludioxonil	Maxim Liquid PSP	40.3% F	5.2 ml	VLH
Fludioxonil + Difenoconazole	Maxim D	1.94 % + 1.94 %	65 - 130 ml	VLH
Fludioxonil + Mancozeb	Maxim MZ	0.5% + 5.7 % DU	0.5 kg	VLH
Mancozeb	Dithane M-45	8 % DU	1.0 kg	VLH
Mancozeb	MancoPlus	16% DU	0.5 kg	VLH
Mancozeb	Penncozeb	80 % DU	0.1 kg	VLH
Mancozeb	Potato ST 16	16% DU	0.5 kg	VLH
Mancozeb	Solan MZ	16% DU	0.5 kg	VLH
Mancozeb + Douglas Fir bark	Tuberseal	16% DU	0.5 kg	VLH
Penflufen / Prothioconazole (1)	Emesto Silver	10 %, 1.8 %	20 ml	LH
Thiophanate-methyl	Senator PSPT	10% DU	0.5 kg	LH
Insecticide				
Clothianidin (2, 3)	Titan ST	48 % SU	20.8 ml	
Imidacloprid (3)	Admire 240	F	26 - 39 ml	VLH
	Alias 240	SC	26 - 39 ml	VLH
Thiamethoxam (4)	Actara 240	SC	10.2 - 24.4 ml	VLH

1. Emesto Silver is contained in the Titan Emesto co-pak
2. Use the high rate of insecticide seed treatment for suppression of wireworms in potatoes
3. Controls Colorado Potato Beetle, Potato Leafhopper, Aphids, and over wintering adults of Potato Flea Beetle
4. Actara is the insecticide included in Cruiser Maxx D.

RESISTANCE MANAGEMENT: Do not use Senator PSPT if Mertect has been used as a post-harvest fungicide.
Do not use Maxim PSP in any two consecutive seed generations.
To avoid development of Colorado Potato Beetle resistance, if Admire, Actara or Alias has been used, do not apply any subsequent applications of Actara, Admire, Alias or Assail.

IN - FURROW FUNGICIDES

Fungicide		Product Rate / 100 m row			Days to Harvest	Hazard Rating	
		Pink Rot Suppression	Silver Scurf	Rhizoctonia		Humans	Fish
Metalaxyl	**Ridomil Gold 480 SL ****	**4 ml**	**-**	**-**	**80**	**VLH**	**MH**
Azoxystrobin	**Quadris F *****	**-**	**4 - 6 ml**	**4 - 6 ml**	**90**	**LH**	**VHH**
Penthiopyrad	**Vertisan**			**15.5 - 31 ml**	**7**	**LH**	**HH**

** Apply directly over the seed pieces in furrow as a 15 - 20 cm band prior to row closure. Apply in a minimum of 30 L of water per ha. To reduce the potential of pink rot resistance if Ridomil has been applied in-furrow, do not apply Ridomil as a foliar spray.
*** Apply as an in furrow spray in 50 - 140 L of water per ha at planting. Mount the spray nozzle so the spray is directed into the furrow as a 15 - 20 cm band just before the seed is covered.

HERBICIDES

SEE NOTES AND PRODUCT LABELS FOR DETAILS ON HERBICIDES

*Weed Control Rating

E - Excellent
G - Good
F - Fair
P - Poor

					Weed Control Rating																		
					annual broad leaves								annual grasses			Perennials							
	Chemical Name	Product Name (s)	Formulation	Product/ha	chickweed	hempnettle	lambsquarters	mustard family	pigweeds	ragweeds	smartweed famil	wild buckwheat	wild radish	barnyard grass	foxtail	crabgrass	quackgrass	Canada thistle	sow thistle	goldenrod	field mint	Potato tolerance	Acute Hazard rating Mammals	Reentry Time (hrs)
BEFORE PLANTING	EPTC	Eptam 8E	EC	4.25 - 8.5 L/ha	F	-	F	P	F	F	F	P	P	G	G	G	F	P	P	-	-	E	VLH	12
	glyphosate	Roundup Weathermax / Ultra 2	SN	0.5 -2.33 L	+	+	+	+	+	+	+	+	+	+	+	+	G	P	E	+	+	P	VLH	12
		Touchdown iQ	SN	0.75 -3.5 L	+	+	+	+	+	+	+	+	+	+	+	+	G	P	E	+	+	P	VLH	
		Roundup Weathermax / Ultra 2	SN	1.67 - 4.67 L	+	+	+	+	+	+	+	+	+	+	+	+	E	E	E	+	+	P	VLH	
		Touchdown iQ	SN	2.5 - 7.0 L	+	+	+	+	+	+	+	+	+	+	+	+	E	E	E	+	+	P	VLH	12
	glyphosate + an approved surfactant	Roundup Weathermax / Ultra 2 or Touchdown iQ + an approved surfactant	SN SURF	As per label when using high water volumes as per surfactant label	+	+	+	+	+	+	+	+	+	+	+	+	E	P	E	+	+	P	-	-
	s-metolachlor	Dual Magnum (915g/L)	EC	1.25-1.75L/ha	P	P	-	-	-	-	-	P	-	G	G	G	P	-	P	P	P	G	VLH	24
PLANTING TO EMERGENCE	linuron	Lorox L (480g/L) or Linuron 480 FL (480g/L)	SU	2.3 - 4.6L/ha	G	G	E	E	G	G	E	E	F	F	F	F	P	-	P	P	P	F	VLH	24
		Lorox (50%)DF	DF	2.2 - 4.3 kg/ha																				
		Linuron 400FL(400g/L)	SU	2.5 - 5.2 L/ha																				
	Linuron + s-metolachlor	Lorox L (480 g/L) or Lorox DF (50%) + Dual II Magnum	SU DF EC	1.8 - 2.3 L/ha 1.75 - 2.25 kg/ha + 1.25 - 1.75 L/ha	G	G	E	E	E	G	E	G	G	E	E	E	P	P	P	P	P	E	LH	-
	metribuzin	Sencor 75DF Sencor Solupak 75 DF Sencor 480F TriCor 75 DF	DF DF SU DF	0.55 - 1.5 kg/ha 0.55 - 1.5 kg/ha 0.84 - 2.2 L/ha 0.75 - 1.5 kg	G	E	E	E	E	E	E	G	E	G	G	G	P	-	P	-	P	G	VLH	12
	metribuzin + s-metolachlor	Sencor 75DF Sencor 480 F TriCor 75 DF	DF SU DF	0.75 - 1.5 kg/ha or 1.1 - 2.25 L/ha + 0.75 - 1.5 kg	G	E	E	E	E	E	E	G	G	E	G	G	P	-	P	-	P	G	LH	-
		+Dual II Magnum	EC	1.25 - 1.75 L/ha																				
	metribuzin + linuron	Sencor 75DF or Sencor Solupak 75DF or Sencor 480F + linuron 480	DF DF SU SU	0.55 - 1.1 kg/ha 0.55 - 1.1 kg/ha 0.85 - 1.75 L/ha + 1.6 - 3.75 L/ha	G	E	E	E	E	E	E	E	E	G	G	G	P	-	P	-	P	G	VLH	-
BEFORE EMERGENCE (GROUND CRACK)	metribuzin	Sencor 75DF Sencor Solupak 75DF Sencor 480F	DF DF SU	0.55 - 1.5 kg/ha 0.55 - 1.5 kg/ha 0.85 - 2.25 L/ha	G	E	E	E	E	E	E	G	G	G	-	-	F	-	P	-	-	G	VLH	12
	paraquat	Gramoxone (200 g/L)	SN	2.8 - 4.25L/ha	+	F	G	G	G	-	F	F	F	P		-	G	P	F	-	F	G	LH	24
	metribuzin + paraquat	Sencor 75DF Sencor Solupak 75DF or Sencor 480F + Gramoxone	DF DF SU SN	0.75 - 1.1 kg/ha 0.75 - 1.1 kg/ha 1.1 - 1.75 L/ha + 2.75 L/ha	G	E	E	E	E	E	E	E	G	G	G	G	G	-	F	-	F	G	VLH	-
	glufosinate ammonium	Ignite	SN	2.7 - 5.0 L/ha	+	E	E	E	E	E	E	E	F	E	E	E	-	-	-	-	F	G	VLH	12
	glufosinate ammonium + metribuzin	Ignite Sencor 75DF Sencor 480F	SN DF SN	2.7 - 5.0 L/ha 0.75 kg/ha 1.1 L/ha	+	E	E	E	E	E	E	E	E	E	E	E	E	-	-	-	F	G	VLH	12
	glyphosate	Roundup Weathermax / Ultra 2 #	SN	0.5 - 2.33 L	G	E	E	E	E	E	E	E	E	E	E	E	G	-	-	+	+	F	VLH	12
		Roundup Weathermax / Ultra 2 #	SN	1.67 -4.67 L	G	E	E	E	E	E	E	E	E	E	E	E	E	-	-	E	G	F	VLH	12

LEGEND

* A dash (-) in the weed control rating indicates lack of information. Do not use a herbicide more than once or apply an additional herbicide during the growing season unless split or combination treatments are registered. A plus (+) in the weed control rating indicates weeds will be controlled if emerged.

** Do not tank mix with other herbicides

*** Do not use Venture L within 90 days of harvest.

*** Do not use Poast within 80 days of harvest

*** Do not use Excel within 35 days of harvest

*** Do not use Select within 60 days of harvest.

*** Do not use Prism within 30 days of harvest

\# Apply after weeds emerged but before potatoes emerge.

NOTE: FOR ADDITIONAL INFORMATION AND CAUTIONS ON HERBICIDE USE, REFER TO "Ontario Ministry of Agriculture and Food
- Guide to Weed Control," Publication 75 and product labels.

HERBICIDES (pg 2)

SEE NOTES AND PRODUCT LABELS FOR DETAILS ON HERBICIDES

***Weed Control Rating**

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					Weed Control Rating																			
					annual broad leaves									annual grasses			Perennials							
	Chemical Name	**Product Name (s)**	**Formulation**	**Product/ha**	chickweed	hempnettle	lambsquarters	mustard family	pigweeds	ragweeds	smartweed famil	wild buckwheat	wild radish	barnyard grass	foxtail	crabgrass	quackgrass	Canada thistle	sow thistle	goldenrod	field mint	Potato tolerance	Acute Hazard rating Mammals	Reentry Time (hrs)
SOON AFTER EMERGENCE CHECK NOTES FOR PRECAUTIONS	metribuzin	Sencor 75DF Sencor Solupak 75DF Sencor 480F TriCor 75 DF	DF DF SU DF	0.55 - 1.5 kg/ha 0.55 - 1.5 kg/ha 1.2 - 2.2 L/ha 0.55 - 1.5 kg/ha	G	E	E	E	E	E	E	G	E	G	-	-	F	-	P			F	VLH	12
	paraquat	Gramoxone (200g/L)	SN	2.8 - 4.25 L/ha	+	F	G	G	G	-	F	F	F	F	-	-	G	-	F	-	F	F	LH	24
POST-EMERGENCE	clethodim (annual grass 2 -6 leaf)	Arrow/X-Factor***	EC + SURF	0.19 L/ha + 0.5% v/v	P	P	P	P	P	P	P	P	P	E	E	E	F	P	P	P	P	E	VLH	24
	clethodim (quackgrass 3-5 leaf)	Arrow/X-Factor***	EC + SURF	0.38 L/ha + 1.0% v/v	P	P	P	P	P	P	P	P	P	E	E	E	E	P	P	P	P	E	VLH	24
	clethodim (annual grass 2 -6 leaf)	Select/Amigo***	EC + SURF	0.19 L/ha + 0.5% v/v	P	P	P	P	P	P	P	P	P	E	E	E	F	P	P	P	P	E	VLH	24
	clethodim (quackgrass 3-5 leaf)	Select/Amigo***	EC + SURF	0.38 L/ha + 1.0% v/v	P	P	P	P	P	P	P	P	P	E	E	E	E	P	P	P	P	E	VLH	24
	fenoxaprop-p-ethyl	Excel Super **, ***	EC	0.67 L/ha	P	P	P	P	P	P	P	P	P	E	E	E	P	P	P	P	P	E	VLH	24
	fluazifop-p-butyl (Annual Grass 2-5 leaf)	Venture L***	EC	1.0L/ha	P	P	P	P	P	P	P	P	P	E	E	G	F	P	P	P	P	E	VLH	24
	fluazifop-p-butyl Quackgrass(3-5 leaf)	Venture L***	EC	2.0 L/ha	P	P	P	P	P	P	P	P	P	E	E	G	E	P	P	P	P	E	VLH	24
	rimsulfuron + Surf	Prism*** + Surf	DF + SURF	60 g/ha + 2L/1000L	G	-	F	G	G	-	-	-	E	E	E	E	G	-	-	E	-	G	LH	4
	sethoxydim + Merge or Assist (Annual Grasses 2-5 leaf)	Poast Ultra***+ Merge or Assist	EC Surf Surf	0.47 L/ha+ 1 L/ha 1 L/ha	P	P	P	P	P	P	P	P	P	E	E	E	P	P	P	P	P	E	VLH	12
	sethoxydim + Merge or Assist (wild oats and volunteer cereals)	Poast Ultra***+ Merge or Assist	EC Surf Surf	0.32 L/ha + 1 L/ha 1L/ha	P	P	P	P	P	P	P	P	P	E	E	E	F	P	P	P	P	E	VLH	12
	sethoxydim + Merge or Assist (Quackgrass 1-3 Leaf)	Poast Ultra***+ Merge or Assist	EC Surf Surf	1.1 L/ha + 1 - 2 L/ha 1-2 L/ha	P	P	P	P	P	P	P	P	P	E	E	E	E	P	P	P	P	E	VLH	12
UP TO 60 DAYS BEFORE HARVEST	EPTC at lay-by	Eptam 8E	EC	4.2 - 5.6 L/ha	F	-	G	P	F	F	F	P	P	G	G	G	F	P	P	-	-	E	VLH	12

LEGEND

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\# Apply after weeds emerged but before potatoes emerge.

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NOTES ON HERBICIDES

All herbicides are known by a chemical name. Agricultural chemical companies use trade names for their products, but, by law, they must include on the label the accepted chemical name for the herbicide and the actual amount of that herbicide in the product.
Supply companies sell products with different concentrations for the same herbicide and over the years some have changed the concentration of active herbicide in a product. Suggested rates in these notes specify the amount of herbicide product required per hectare.

CLETHODIM sold as **SELECT** or **ARROW** contains 240 g/L of clethodim. **SELECT** should be used at all times in a tank-mix with the adjuvant **AMIGO**. **ARROW** should be used at all times in a tank-mix with the adjuvant **X-ACT**. Clethodim is a systemic postemergence herbicide with uptake primarily through the leaves. Potatoes are tolerant to clethodim at all growth stages. Thorough coverage of the leaf foliage is necessary for consistent grass control. Do not apply if rainfall is expected within 1 hour of application.The time for complete control is normally 7 to 21 days depending on growing conditions and crop competition. Apply Select or Arrow when the annual grasses are in the 2 to 5 leaf stage and for optimum control when quackgrass is in the 3 to 5 leaf stage.

EPTC, sold as **Eptam 8E**, contains 800 g emulsifiable concentrate (EC) of EPTC per litre. It is applied under low pressure 200 kPa in 110-340 litres of water per hectare. Also available in granular formulations, it is used for potatoes as a pre-planting, pre-emergence or post-emergence treatment for many weeds, including annual grasses, quackgrass and nutsedge. A few broadleaf weeds, such as wild radish and wild mustard are not controlled. For control of annual grasses apply and incorporate EPTC either pre-planting or at lay-by. For control of dense stands of nutsedge and quackgrass apply and incorporate EPTC pre-planting. The underground quackgrass rhizomes must be cut up thoroughly so that four or less nodes remain on a stem. This is best done with discs set to cut 15 to 20 cm deep.

EPTC must be incorporated into the soil immediately to prevent loss of the herbicide. Once trapped into the soil, the vapour which forms when EPTC comes into contact with moisture acts to destroy germinating weed seeds and quackgrass rhizomes if the rhizomes are cut into short lengths of 7.5 cm or less. The soil must be in good tilth and have a dry surface. EPTC sprayed on wet soils vaporizes quickly into the air and is lost. It is less active in cold soils than in warm soils. It is difficult to incorporate into stoney soil. Whenever possible, application and incorporation should be done in the same operation

EPTC is incorporated using power driven cultivation equipment set to cut to a depth of 5 to 8 cm, or tandem discs set to cut to a depth of 10 to 15 cm, operated at 6.4 to 9.7 kilometres per hour, or a Danish type cultivator, with tines set on 15 to 20 cm centers, set 10 cm deep, operated at 10 to 13 km/hr. and followed by a spike tooth harrow or some other leveling device which extends beyond the ends of the discs or cultivator.

An overspray with a pre-emergence or post-emergence herbicide to control germinating annual broadleaf weeds is usually required to control some weeds tolerant to EPTC.

FENOXAPROP ETHYL, sold as **Excel** Super contains 80.5 g of fenoxaprop-p-ethyl per litre of Excel Super.

Fenoxaprop-p-ethyl is applied post-emergence to the potatoes for control of annual grasses in the 1 to 6 leaf stage. It will control green and yellow foxtail, barnyard grass, crabgrass, old witch grass, fall panicum and volunteer corn. Fenoxaprop-p-ethyl does not control broadleaf weeds, sedges, quackgrass or other perennial grasses. Second flushes of annual grasses will not be controlled since fenoxaprop-p-ethyl is not residual.

Apply Excel Super in at least 100 litres of water per hectare. Thorough coverage of the foliage is essential for effective grass control. Application through flat fan nozzles at a 45 degree angle forward will result in the best spray coverage. Do not apply if rain is expected within 1 hour of application.

As fenoxaprop-p-ethyl controls only annual grass weeds, it is important to control broadleaf weeds with another herbicide. A time interval of four days before or after fenaxaprop-p-ethyl application is required before any other pesticide is applied.

FLUAZIFOP-P-BUTYL, sold as **Venture L** contains 125 g fluazifop-p-butyl per litre. It is applied post-emergence to the potatoes and weeds and will give control of many annual grasses and also quackgrass. It does not control broadleaf weeds or sedges such as nutsedge. Growth of grasses stops soon after application but destruction of the whole plant may take several weeks. For annual grass control, apply when the annual grasses have 2-5 leaves. For quackgrass control, apply when the quackgrass has 3 to 5 leaves on each shoot. Do not apply if rainfall is expected within 2 hours of application.

GLYPHOSATE, sold as **Roundup Weathermax or Roundup Ultra 2** containing 540 g of acid equivalent of glyphosate per litre present as potassium salt, or **TOUCHDOWN iQ** containing 360 g of acid equivalent of glyphosate per litre present as diammonium salt, for perennial weed control prior to planting potatoes. Apply glyphosate in the spring or fall for quack (couch) grass control. The quackgrass must be at least 20 cm in height (3 to 4 leaf stage). Tillage prior to application will reduce control of quackgrass.

Weed control with glyphosate is reduced if dirty water is used for application. Where tillage is desired, delay for 5 to 7 days after application. Glyphosate has no soil activity. Therefore, it will not injure crops planted in the treated area. Roundup Wheathermax or Roundup Ultra, when used after weed emergence but before ground crack and potato emergence will control emerged weeds. Emerged potato plants will be injured and reduced yield may result.

LINURON* sold as **Lorox L** or **Linuron 480 FL** containing 480 g Linuron per litre or **Linuron 400 FL** with 400 g/L linuron, or **Lorox DF** containing 50% linuron. Apply linuron before potato sprouts emerge, never on the sprouts.

Abnormally heavy rainfall following application may cause crop injury. However, moisture is needed for good weed control action. Potato sets should be 5 cm below the treated soil.

The high rate usually controls annual grasses such as barnyard grass. Do not use on sand or coarse textured soils low in organic matter. Use the higher rate on clay.

Linuron formulated as soluble granular (DF) requires constant agitation to keep it in suspension.

METRIBUZIN sold as **Sencor Solupak 75DF**, and **Sencor DF** (dry flowable) 75% metribuzin, **Sencor 480F**, a liquid, contains 480 g/L. Metribuzin can be used pre-emergence or post-emergence on potatoes. The higher rate is usually required to control annual grasses and dense weed infestations. Also, the higher rate will retard the growth of quackgrass (use the lower rate for broadleaf weed control only). Moisture is needed shortly after a pre-emergence application for better weed control.

Do not use on Belleisle, Tobique, Sante or Tolaas cultivars. Use only pre-emergence on Shepody cultivars. Do not use on muck soil. Fall-seeded cover crops and certain vegetables such as cole crops, seeded the following spring are likely to be injured. Avoid overlaps that will increase dosages above the recommended. Read the manufacturer's label.

PRE-EMERGENCE APPLICATION (PLANTING TO GROUND CRACK) OF METRIBUZIN IS PREFERRED. However, where it is not possible to spray before crop emergence, metribuzin can be applied early post-emergence before weeds are 4 cm high and before first emerged potato tops are 7.5 cm high. This treatment may cause temporary yellowing and/or leaf burn, especially when the crop is under the stress of poor growing conditions such as cool, wet, cloudy weather. Under Atlantic Canada conditions, a few early post-emergence applications have occasionally reduced vine growth sufficiently to retard bulking and possibly to reduce yield. However, under these situations, the use of metribuzin early post-emergence to potatoes could be better than abandoning the crop to weeds such as barnyard grass which are difficult to control by cultivation.

Some of the limitations on early post-emergence applications are as follows:

a) Do not use when plants are under stress, such as cool, wet, cloudy weather or very dry soil conditions.

b) If insufficient metribuzin was used pre-emergence, it may be necessary to apply an additional early post-emergence treatment to control annual grass. In one season, do not apply more than a total of 1.1 kg active metribuzin per hectare.

c) Weed control with early post-emergence application is most effective when spray is applied before weeds are 4 cm high.

d) Do not apply metribuzin early post-emergence on Shepody, Tobique, Belleisle, Sante, Tolaas, red-skinned varieties or potatoes grown for early market.

e) Superior and Norchip are mid-season varieties which appear to be sensitive to metribuzin applied post-emergence.

PARAQUAT, sold as **Gramoxone** containing 200 g paraquat per litre kills weeds on contact with the foliage. Apply in 280 to 560 litres of water per hectare to emerged weeds including quackgrass. It can be used postemergence on potatoes up until the stems are 5 cm high (one week after ground crack), except Russet Burbank. Do not apply postemergence to potatoes in the evening, or on cloudy days, or when the plants are under moisture shortage. Temporary chlorosis (loss of leaf colour) of potato leaves will occur.

Application of paraquat for emergency control of quackgrass and emerged annual grass may be made when shoots are up to 10 cm high (not to Russet Burbank) but potato leaf chlorosis may be more severe and yield could be reduced. Late application should only be considered when quackgrass or annual grasses threaten the crop.

Use clear water for applying paraquat as it is deactivated by clay or organic particles.

Paraquat is inactivated on contact with the soil so there is no residual action in the soil. If new weed growth appears, it will be necessary to cultivate or use a post-emergence herbicide. Usually, the lay-by cultivation (hilling) will be sufficient. For residual control of annual broadleaf weeds and annual grasses, tank mix paraquat and metribuzin or tank mix paraquat and linuron or monolinuron. Use the lower rate of linuron, or monolinuron on lighter soils and the higher rate on heavier soils with high organic matter. Apply the tank mix before the potatoes emerge.

RIMSULFURON sold as **PRISM** containing 25 % rimsulfuron, is a dry flowable formulation in water soluble bags. It is applied in a minimum of 100 l/ha of water and must be used within 24 hours as the herbicide will degrade in acidic or highly alkaline water. It must be applied with a non-ionic surfactant as recommended on the label. Mix **Prism** with at least one quarter of the water first and add the surfactant after the herbicide is thoroughly mixed. **Prism** is applied as a post-emergence treatment to control annual grasses in the 1 to 6 leaf stage and quackgrass in the 3 to 6 leaf stage. Control of some broad-leaf weeds is also obtained. Do not apply if rainfall expected within 2 hours of application.

SETHOXYDIM, sold as **Poast Ultra** contains 450 g of sethoxydim per litre. Sethoxydim is a postemergence, contact and systemic herbicide for control of certain grasses and uptake is primarily through leaves. Thorough coverage of the foliage is necessary for consistent grass control. Complete annual grass destruction takes 7 to 21 days depending on growing conditions and crop competition. Destruction of quackgrass may take 6 to 8 weeks.

Application is made at the 1 to 6 leaf stage of annual grasses and at the 3 leaf stage of quackgrass. A cultivation no sooner than 7 days after application of sethoxydim will improve grass control. Best results are obtained in water volumes of 50 to 200 litres per hectare. Do not use flood jet or hollow cone nozzles with this herbicide as level of grass control will be reduced. See product label of **Poast Ultra** for information on rate of application and mixes with surfactants **Merge** and **Assist**. Surfactants are required to be used with **Poast Ultra**. This herbicide does not control broadleaf weeds. Use an appropriate pre-emergence herbicide to control broadleaf weeds. Do not apply if rainfall is expected within 1 hour of application.

S-METOLACHLOR , sold as **Dual II Magnum** containing **915 g/L** emulsified concentrate (**EC**). It controls large and smooth crabgrass, witch grass, barnyard grass, fall panicum, green and yellow foxtail, yellow nutsedge, American nightshade and eastern black nightshade. For control of yellow nutsedge apply pre-plant incorporated (ppi) (see label) or for annual grasses either ppi or pre-emergence. Use the higher rate wherever annual grasses or yellow nutsedge predominates or densities of weeds are expected to be high. Do not apply to potatoes at ground crack or if potatoes have emerged. Rainfall within 10 hours is required for maximum activity of the pre-emergence application. Residual activity will normally be retained for 10 - 14 weeks. Winter cereals may be planted 4 - 5 months after s-metolachlor application. See the product label for registered tank mix combinations. Do not use s-metolachlor on muck soils or coarse textured soils low in organic matter. Do not use on the variety Superior.

ATTENTION!!!!

WEAR personal protective equipment **(PPE)** found on the pesticide label when mixing, loading and applying to reduce your pesticide exposure. PPE is important to decrease potential immediate and long term risk.

INSECT CONTROL

The management of insect pests on potatoes continues to rely on synthetic insecticides but their continued usefulness can only be insured by the concurrent use of cultural and alternative control methods.

Scouting

Monitor each field once or twice a week to identify the insect pests present and determine the relative abundance of their different life stages. Note the growth stage of the crop. Keep in mind that the previous crop, cropping practices and the type of vegetation surrounding the field affect the presence and the development of the insects. Information on the changes in the abundance of insect pests in your region can be obtained from a variety of pest forecasting and monitoring services offered by government extension specialists and private consultants.

Use all the information gathered to develop an insect control program for the season or to respond to a specific pest outbreak.

Alternative Control Methods

A number of non-insecticidal control methods are now available. These methods are environmentally friendly and help prolong the effective life of insecticides if they are used consistently, year after year. These methods are most effective against the Colorado potato beetle but many will help reduce the abundance of other insects.

Field rotation. Rotate fields frequently and isolate fields whenever possible. This will delay field colonization by overwintered adults and reduces their abundance in the crop. Increasing the distance between last year's potato field and this year's potato field will increase the level of beetle control.

Plastic-lined trenches. Install trenches around potato fields adjacent to Colorado potato beetle overwintering sites or field planted to potatoes the previous year. On the average, trenches reduce the abundance of overwintered adult beetles on the crop by 50%. This will also reduce the number of egg masses in the potato field.

Propane burner. Very effective at reducing the abundance of overwintered adult Colorado potato beetles on short plants up to 4" in height. Also reduces the viability of egg masses. More than one pass per season may reduce yield.

Resistance Management

Insecticide resistance is present in many populations of Colorado potato beetles in the Atlantic region. It is recommended that a few simple steps be followed to manage the problem with the Colorado potato beetle and prevent the development of insecticide resistance.

1. Reduce the number of insecticide applications by using alternative control methods.
2. Apply an insecticide only if the abundance of an insect pest has reached a level where it can cause an economic yield loss.
3. Rotate to an insecticide of a different chemical class after each application of a particular insecticide. If using an insecticide at planting - Make sure any subsequent foliar applications are of a different chemical class of insecticides.
4. Use the right nozzles on a recently calibrated sprayer to insure that the insecticide is applied to the target pest on the crop with minimal drift to the environment. Consider banding rather than treating the whole area.
5. Apply only at the recommended rate for the pest.
6. All insecticides listed in this guide will control some potato insect pests, however, differences in their respective modes of action, persistence, sensitivity to temperature and pest specificacy must be considered when choosing a chemical.

INSECTICIDES

Please see insecticide notes and /or your Extension Specialist.

S - Spray
B - Band

I - In Furrow
BR - Broadcast

PL - Apply at Planting
ST - Seed Treatment
* - Registered
- - Information not available

Chemical or Biological	Product	Formulation	Product/ha	Days to Harvest	GREEN PEACH APHID	COMMON POTATO APHID	BUCKTHORN APHID	COLORADO POTATO BEETLE	FLEA BEETLE	WIREWORMS	EUROPEAN CORN BORER	TARNISHED PLANT BUG	LEAFHOPPERS	APPLICATION METHOD	ACUTE HAZARD RATING MAMMALS Oral	Inhalation	Dermal	Fish	Re-entry time
Anthranilic diamides																			
Chlorantraniliprole	CORAGEN	SU	250 - 375 ml	14				*			*			S	VLH	VLH	VLH	LH	12 hours
Benzoylphenyl																			
Novaluron	RIMON 10 EC	EC	410 - 820 ml	14				*			*			S	VLH	VLH	VLH	MH	12 hours
Carbamate																			
carbaryl	SEVIN XLR	SU	1.25-6.4 L	7				*	*		*	*	*	S	LH		VLH	VHH	24 hours
methomyl	LANNATE SP	SP	0.54 kg	3	*	*	*		*				*	S	VHH	MH	VLH	MH	24hours
oxamyl	VYDATE L	EC	2.3-3.0 L	7	*	*		*	*			*	*	S	EH	EH	LH	MH	24 hours
pirimicarb	PIRIMOR 50DF	DF	0.425-0.55 kg	7	*	*	*							S	LH		LH	LH	24 hours
Chlorinated hydrocarbon																			
endosulfan	THIONEX EC	EC	1.5 - 2 L	1	*	*	*	*	*			*	*	S	MH	VLH	VHH	EH	48 hours
	ENDOSULFAN 50W	WP	1.0 - 1.5 kg	1	*	*	*	*	*			*	*	S					
	ENDOSULFAN 400 EC	EC	1.5 - 2 L	1	*	*	*	*	*			*	*	S					
Chloronicotinyl																			
acetamiprid *	ASSAIL 70 WP	WP	0.4 - .86 kg	7	*	*	*	*						S	VLH	VLH	VLH	LH	12 hours
clothianidin *	CLUTCH 50 WDG	WDG	0.266-0.448 kg	PL	*	*	*	*					*	PL/I	VLH	VLH	VLH	LH	
	CLUTCH 50 WDG	WDG	0.07-0.105 kg	14	*	*	*	*					*	S					
	TITAN ST	SU	20.8 ml / 100kg of seed	PL / I	*	*	*	*		*				ST	VLH	VLH	VLH	LH	12 hours
imidacloprid *	ADMIRE 240F	FLOW	0.85-1.3 L	PL	*	*	*	*	*				*	PL/I	VLH	VLH	VLH	LH	
	ADMIRE 240F	FLOW	26-39 ml / 100 kg of seed	PL	*	*	*	*	*				*	ST	VLH	VLH	VLH	LH	
	ADMIRE 240F	FLOW	0.2 L	7	*	*	*	*					*	S					24 hours
	ALIAS 240 SC	SC	0.85-1.3 L	PL	*	*	*	*	*				*	PL/I	VLH	VLH	VLH	LH	
	ALIAS 240 SC	SC	26-39 ml / 100 kg of seed	PL	*	*	*	*	*				*	ST	VLH	VLH	VLH	LH	
	ALIAS 240 SC	SC	0.2 L	7	*	*	*	*					*	S					24 hours
imidacloprid * + deltamethrin	CONCEPT	SU	650 ml	7	*	*	*	*	*		*	*	*	S					
thiamethoxam *	ACTARA 240 SC	SC	.378 - .489 ml		*	*	*	*					*	PL/I	VLH	VLH	VLH	LH	12 hours
	ACTARA 25 WG	WG	0.105 kg	7	*	*	*	*					*	S	VLH	VLH	VLH	LH	12 hours
Naturalyte																			
spinetoram	DELEGATE	WG	0.16-0.24 kg	7				*			*			S	VLH	VLH	VLH	LH	
spinosad	SUCCESS 480	SC	83-166 ml	7				*			*			S	VLH	VLH	VLH	LH	12 hours
	ENTRUST 80 W	WP	0.05 - 0.1 kg	7				*			*			S					
Organophosphate																			
chlorpyrifos	LORSBAN NT	EC	1.0 L	7				*	*			*		S	LH		LH	EH	24 hours
	LORSBAN 50W	WP	1.125-2.25 kg	7					*			*		S					
	PYRIFOS 15 G	G	11.2 kg	PL						*				PL/I	LH		LH	EH	24 hours
	PYRINEX 480EC	EC	1.0 L	7				*	*			*		S					

Because of Colorado Potato Beetle resistance to insecticides and to prevent the development of resistance in other pests, AVOID REPEAT APPLICATIONS OF INSECTICIDES FROM THE SAME CHEMICAL GROUP.

* To avoid development of Colorado Potato Beetle resistance, do not use Admire, Assail, Alias or Actara as a foliar spray if Admire, Alias, Actara Clutch or Titan in-furrow or seed treatment has been used.

INSECTICIDES (pg 2)

Please see insecticide notes and /or your Extension Specialist.

S - Spray
B - Band

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Chemical or Biological	Product	Formulation	Product/ha	Days to Harvest	GREEN PEACH APHID	COMMON POTATO APHID	BUCKTHORN APHID	COLORADO POTATO BEETLE	FLEA BEETLE	WIREWORMS	EUROPEAN CORN BORER	TARNISHED PLANT BUG	LEAFHOPPERS	APPLICATION METHOD	ACUTE HAZARD RATING MAMMALS Oral	Inhalation	Dermal	Fish	Re-entry time
Organophosphates cont...																			
diazinon	DIAZINON 50EC	EC	1.1 L	14	*	*	*	*	*				*	S					
	DIAZINON 500EC	EC	1.1 L	14	*	*	*	*	*				*	S					
	DIAZINON 50W	WP	1.1 kg	14	*	*	*	*	*				*	S					
dimethoate	CYGON 480EC	EC	0.55-1 L	7	*	*	*						*	S					
	DIMETHOATE PLUS	EC	0.7 L	7	*	*	*						*	S					
	DIMETHOATE 480EC	EC	0.55-1.1 L	7	*	*	*						*	S					
	LAGON 480E	EC	0.55-1.1 L	7	*	*	*					*	*	S					
malathion	MALATHION 50EC	EC	1.5-2.25 L	3	*	*	*							S					
	MALATHION 25W	WP	2.75-4.25 kg	3	*	*	*	*					*	S					
	MALATHION 500E	EC	1.5-2.25 L	3	*	*	*	*					*	S					
	MALATHION 85E	EC	1.0 L	3	*	*	*						*	S					
naled	DIBROM	EC	1.1 L	4				*	*				*	S	LH	VLH	LH	VHH	48 hours
phorate	THIMET 15G	GR	15.4-23.6 kg	PL	*	*	*	*	*	*			*	B/I	VHH		LH	EH	48 hours
phosmet	IMIDAN 50WP	WP	2.25 kg	7		*		*	*				*	S	LH		VLH	VHH	5 Days
Pyridine Azomethine																			
pymetrozine	FUFILL 50 WG	WG	193 g +Surf	14	*	*	*							S	VLH	VLH	VLH	LH	12 hours
Pyridine Carboxamide																			
flonicamid	BELEAF 50 SG	SG	0.12 - 0.16 kg	7	*	*	*							S	VLH	VLH	VLH	LH	12 hours
Sulfoximines																			
sulfoxaflor	CLOSER	SC	.05 - .15 L	7	*	*	*							S					12 hours
Synthetic pyrethroid																			
cypermethrin	RIPCORD 400	EC	0.065-0.125 L	7				*	*			*	*	S	LH	VLH	VLH	VHH	24 hours
	UP CYDE 2.5 EC	EC	0.14-0.2 L	7				*	*			*	*	S					
deltamethrin	DECIS 5EC	EC	0.1-0.25 L	1		*	*	*	*		*	*	*	S	LH	LH	VLH	VHH	24 hours
deltamethrin + imidacloprid	CONCEPT	SU	650 ml	7	*	*	*	*	*		*	*	*	S					
cyhalothrin-lamda	MATADOR 120EC	EC	0.083-0.125 L	7				*	*		*	*	*	S	MH	VLH	LH	VHH	24 hours
permethrin	PERM UP	EC	0.18-0.26 L	1				*	*		*	*	*	S	LH	VLH	VLH	VHH	24 hours
	POUNCE	EC	0.19-0.25 L	1				*	*		*	*	*	S	LH	VLH	VLH	VHH	when dry
	AMBUSH 500EC	EC	0.14 - 0.20 L	1				*	*		*	*	*	S	LH	VLH	VLH	VHH	when dry
	BIO-ENVIRONMENTAL PERMETHRIN	SC	0.185 L	1				*	*			*	*	S					
Tetramic acid																			
Spirotetramat	MOVENTO 240	SC	0.22 - 0.365 L	7	*	*	*							S	VLH	VLH	MH	-	12 hours
Botanical																			
Kaolin	SURROUND	WP	6.25 - 12.5 kg	0								*		S	VLH	VLH	VLH	-	
Bacteria																			
Bacillus thuringiensis tenebrionis	NOVODOR	FC	4-8 L	0				*						S	VLH	VLH	VLH	VLH	when dry

Because of Colorado Potato Beetle resistance to insecticides and to prevent the development of resistance in other pests, AVOID REPEAT APPLICATIONS OF INSECTICIDES FROM THE SAME CHEMICAL GROUP.

NOTES ON INSECTICIDES

Many of the insecticides used on potatoes are highly poisonous to man, animals, fish and beneficial insects. Poisoning of the applicator can occur by swallowing, inhaling or by skin contact. FOLLOW ALL PRECAUTIONS STATED ON THE PRODUCT LABEL. It is against the law not to comply with the label instructions of a pesticide under the Pest Control Products Act of Canada. Contamination of fisheries waters by pesticides is also against the law under the Fisheries Act of Canada.

Anthranilic Diamides

Coragen provides extended residual control of Colorado potato beetle and European corn borer (ECB) in potatoes. It is from the Group 28, Anthranilic diamide class of pesticides. Effective at multiple stages of the life cycle, Coragen provides excellent crop protection. The rapid cessation of feeding, residual activity and the rainfast properties of Coragen deliver rapid and long-lasting plant protection under a range of growing conditions.

Benzoylphenyl

Rimon is an insect growth regulator and is effective against Colorado potato beetle and European corn borer (ECB). Its primary mode of action is by disrupting cuticle formation and deposition occurring when insects change from one developmental stage to another resulting in death at molting. Rimon has no effect on adult stages of insects. Scout for ECB to monitor egg laying and egg hatch to determine application timing.
This product may be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Carbamates

Non systemic carbamates generally remain effective for 7 - 10 days.

Carbaryl has low toxicity to man and animals but is highly toxic to bees. It is effective against beetles for 3-4 days under favourable conditions (the XLR formulation may be wash-off resistant for as much as 7 - 10 days). It does not control aphids. Repeated applications usually cause an increase in aphid populations, since it kills aphid predators.

Methomyl has low toxicity to man and animals but is highly toxic to bees. Foliar applications are effective against aphids and flea beetles through contact and some systemic action. Effective insect control lasts less than 7 days.

Oxamyl has moderate toxicity to humans. It is effective against the beetles and the aphids through contact and systemic action.

Pirimicarb has low toxicity to humans. It is very effective any time against aphids, acting through contact and vapour action.

Chlorinated hydrocarbons

Endosulfan is moderately toxic to humans. It is effective against beetles and the buckthorn aphid. Low temperatures decrease its effectiveness, especially against the buckthorn aphid.

Chloronicotinyls

Nicotinyls affect the nervous system of insects by blocking a specific type of receptor on the post-synapse.

Acetamiprid is effective against the Colorado potato beetle and aphids.

Clothianidin is a broad spectrum effective insecticide providing protection against wide range of pests including Colorado potato beetle, aphids, flea beetles, leaf hoppers and wireworm suppression.

Imidacloprid is effective against the Colorado potato beetle, the flea beetle, leaf hoppers and aphids. Both products have low toxicity to humans and animals but when used as a foliar spray are highly toxic to bees.

Thiamethoxam is a subclass of the chloronicotinyls family. It is effective against the Colorado potato beetle, aphids and leafhoppers. Like other products in this chemical group is has low toxicity to humans and animals and when used as a foliar spray is highly toxic to bees

Naturalyte

Unique mode of action associated with insect nervous system and acts through contact and ingestion. It is not systemic in the plant.

Spinosad is effective against Colorado potato beetle and European Corn Borer. It has very low toxicity to humans, animals and beneficial insects but highly toxic to bees. Maximum application per season is 249 ml/ha. Target Colorado potato beetle at egg hatch and small larval stages.

Organophosphates

Non-systemic organophosphates remain effective for 7-14 days.

Chlorpyrifos has low toxicity to humans. It works through contact, ingestion and vapour action against the beetles. It does not control aphids. Pyrifos 15 G applied in furrow at planting time is only registered for wireworm control.

Diazinon has low toxicity to human and animals but is highly toxic to bees. It works through contact, systemic and ingestion action against aphids, Colorado potato beetles, and potato flea beetles.

Dimethoate has low toxicity to humans. It is effective against the potato and the buckthorn aphids by contact and systemic action.

Malathion has low toxicity to man and animals but is highly toxic to bees. It is registered for use against aphids and, most formulations, the Colorado potato beetle.

Methamidophos is highly toxic to humans. It is effective against both species of beetles and all three species of aphids by contact and local systemic action. It will control large populations of aphids late in the season. It provides a quick, initial knockdown as well as residual control.

Naled is moderately toxic to humans. It is a fast acting insecticide that gives good control of the beetle. Do not apply above 32°C.

Phorate is highly toxic to humans. It is effective against all pests. It does not persist long enough to control the second peak of flea beetles and its control of aphids is variable.

Phosmet has low toxicity to humans. It is a contact and stomach poison that is effective against the beetles.

Pyridine Azomethines

Pymethrozine mode of action is of a neural inhibition of feeding behavior.

Pymetrozine is very selective for activity against the Green Peach, Potato, Foxglove and Buckthorn aphid. Aphids stop feeding after exposure by contact or ingestion. Aphids do not feed again and subsequently die after several days due to starvation or dessication. A reduced risk product for humans and animals. Thorough spray coverage of plant foliage is essential for optimum control. The use of an adjuvant such as Agrol 90, Agsurf, LI 700 or Sylgard 309 is recommended to improve the performance of Fulfill under drought stress conditions.

Synthetic Pyrethroids

In contrast to carbamates and organophosphates the toxicity of pyrethroids decreases as temperature rises. Whenever possible synthetic pyrethroids should be applied at temperatures below 24°C. They are generally toxic to bees and other beneficial insects but most are of low mammalian toxicity. These insecticides are extremely toxic to fish, shellfish and aquatic organisms which are food for fish and waterfowl. Careless use can seriously harm sport and commercial fisheries and wildlife.

Although pyrethroids are generally poor potato aphicides, they may reduce probing by colonizing aphids which may protect the plants from infestation and virus spread as long as the residual dose is sufficient, even if it is no longer lethal. Being virtually insoluble in water, they offer excellent resistance to leaching out during rain. They should not be used on muck soils.

Allow a minimum of 24 hours before evaluating the efficacy of a pyrethroid spray to permit enough time for the insects to return to the plant and feed some more after the knockdown effect.

Cypermethrin is effective against the Colorado potato beetles by contact and stomach action.

Deltamethrin is effective against the Colorado potato beetles as a contact and stomach poison. Effective against the common potato aphid and the buckthorn aphid at higher rates.

Cyhalothrin-lambda is effective against Colorado potato beetles by contact and stomach action.

Permethrin is effective against the Colorado potato beetles. Thorough coverage of plants is important and the higher rate is required for heavy infestations. It is a contact and stomach poison.

Tetramic Acid

Movento (Spirotetramat) has low toxicity to humans and animals. Spirotetramat provides excellent, long-term control of immature and adult female stages of aphids, Psyllid, Whitefly. Following a foliar application Spirotetramat rapidly moves into leaf vascular tissue and is carried up and down the plant system to protect leaf and root tissue. Spirotetramat's residual activity continues to protect new plant growth. Most effective when applied as a preventative or early threshold treatment – prior to the establishment of a highly damaging pest population. Spirotetramat must be applied with a non-ionic adjuvant (such as Agral 90) at 0.2% volume to volume.

Bacteria

Some varieties of the bacterium *Bacillus thuringiensis* are active against the larvae of the Colorado potato beetle. For optimum results, apply early in the season against small actively feeding larvae. Repeat the application twice at intervals of 5-7 days or after a heavy rainfall. The bacteria are not fast acting. Larval death occurs only 1 - 5 days later but the larvae stop feeding after eating foliage sprayed with the bacteria. These products are not very effective against large larvae and will not kill adults and other insect species.
Bacillus thuringiensis **(Novodor)** is effective against the Colorado potato beetle larvae by stomach action. The higher rate is required for heavy infestations.

FOLIAR FUNGICIDES

Fungcide Group Code	Foliar Fungicides	PRODUCT RATE / HA			DAYS TO HARVEST	HAZARD RATING		AQUATIC BUFFER ZONE (10)
		LATE BLIGHT	EARLY BLIGHT	BOTRYTIS (GRAY MOLD)		HUMANS	FISH	
	Azoxystrobin							
11	Quadris F	0.8 L	0.5 - 0.8 L	-	1	VLH	VHH	
	Azoxystrobin + Difenoconazole							
11, 3	Quadris Top		0.566 - 1.0 L	-	1	VLH	VHH	
	Ametoctradin + Dimethomorph							
40, 45	Zampro	0.8 - 1.0 L			4			
	Boscalid							
7	Cantus (Lance) 70 WDG (1)	0.175 - 0.315 kg + 1.2 - 2.4 L Bravo or 1.1 - 2.25 kg Polyram	0.175 - 0.315 kg	-	30	VLH	VHH	10- 15 M
	Bacillus							
44	Serenade Max		2.0 - 4.0 kg		0	VLH	VLH	
	Chlorothalonil							
M	Bravo 500	1.2-2.4 L	1.6-2.4 L	1.6-2.4 L	1	VLH	VHH	15 M
M	Bravo ZN	1.2-2.4 L	1.6-2.4 L	1.6-2.4 L	1	VLH	VHH	15 M
M	Echo 90DF	0.7-1.3 kg	0.9-1.9 kg	0.9-1.3 kg	1	VLH	VHH	15 M
M	Echo 720	0.8-1.7 L	1.1 L	1.1 L	1	VLH	VHH	15 M
	Chlorothalonil + Propamocarb							
M, U	Tattoo C	2.7 L			7			15 M
	Copper							
M	Parasol WP (2)	1.1-2.5 kg + 1.75-2.25 kg mancozeb	1.1-2.5 kg + 1.75-2.25 kg mancozeb	-	1	VLH	VHH	
M	Parasol Flowable (3)	0.80-1.80 L + 1.75-2.25 kg mancozeb	-	-	1	VLH	VHH	
M	Kocide 2000 (4)	0.8-1.6 Kg + 1.75- 2.25 kg mancozeb	0.8-1.6 Kg + 1.75-2.25 kg mancozeb	-	1	VLH	VHH	
	Cyazofamid							
21	Ranman 400SC	0.1 - 0.2 L			7	VLH	MH	
	Torrant 400 SC	0.1 - 0.2 L			7	VLH	MH	
	Cymoxanil							
27	Curzate 60 DF	225 g + 1.35 - 1.6 kg mancozeb	-	-	8	VLH	LH	50 M
	Cymoxanil + Famoxadone							
27,11	Tanos 50 DF	0.56 - 0.84 kg	0.56 - 0.84 kg	-	14	VLH	VHH	44 M
	Dimethomorph							
40	Acrobat 50 WP (5)	0.45 kg + chlorothalonil, mancozeb or metiram	-	-	4	VLH	MH	50 M
	Fenamidone							
11	Reason 500 SC (6)	200 ml + chlorothalonil or mancozeb	200 ml + chlorothalonil or mancozeb	-	14	VLH	VHH	
	Fluazinam							
29	Allegro 500 F (7)	0.4 L	-	-	14	VLH	VHH	26 M
	Fluopicolide							
43	Presidio	0.22 - 0.292 L			7			
	Mancozeb / Maneb							
M	Dithane DG Rainshield NT	1.1-2.25 kg	1.1-2.25 kg	-	1	VLH	MH	
M	Manzate Pro-Stick	1.1-2.25 kg	1.1-2.25 kg	-	1	VLH	MH	
M	Penncozeb 80 WP	1.1-2.25 kg	1.1-2.25 kg	-	1	VLH	MH	
M	Penncozeb 75 DF Raincoat	1.1-2.25 kg	1.1-2.25 kg	-	1	VLH	MH	
	Mandipropamid							
40	Revus	0.4 - 0.6 L	-	-	14	VLH	MH	
	Metalaxyl (8)							
4	Ridomil Gold MZ	2.5 kg	2.5 kg	-		VLH	MH	
4	Ridomil Gold/Bravo Twin Pak	8.83 L/4ha	8.83 L/4ha	8.83 L/4ha		VLH	MH	15 M
	Metiram							
M	Polyram DF	1.1-2.25 kg	1.1-2.25 kg	-	1	VLH	VHH	
	Penthiopyrad							
7	Vertisan		1 - 1.75 L	1.25 - 1.75 L	7			
	Phosphorous acid							
33	Phostrol	2.9 - 11.6 L			0			
	Propamocarb + Chlorothalonil							
U,M	Tattoo C	2.7 L			7			15 M
	Pyraclostrobin							
11	Headline 250 EC	0.45 - 0.67 L	0.45 -0.67 L	-	3	VLH	VHH	35 M
	Pyraclostrobin + Metiram							
11, M	Cabrio Plus	2.25 - 3.35 kg	2.25 - 3.35 kg					
	Pyrimethanil							
9	Scala 400 SC (9)	-	.75 L + 1.6 -2.4 L Bravo	-	7	VLH	VHH	15 M
	Zineb							
M	Zineb 80 W	1.7-3.3 kg	1.7-3.3 kg	-	1	VLH	MH	
	Zoxamide							
M,22	Gavel 75 DF	1.7-2.25 kg	1.7-2.25 kg	-	3	VLH	MH	25 M

- Product not registered for use against the particular disease.

(1) - Maximum number of application per year is 4 . To reduce the potential of fungicide resistance do not apply more than 2 consecutive applications before alternating to a fungicide with a different mode of action.

(2) - These products may be applied without a mancozeb product at 3.4 kg/ha at topkill with a topkiller or after topkill prior to harvest.

(3) - These products may be applied without a mancozeb product at 2.40 L/ha at topkill with a topkiller or after topkill prior to harvest.

(4) - These products may be applied without a mancozeb product at 2.40 Kg/ha at topkill with a topkiller or after topkill prior to harvest.

(5) - Do not apply more than 3 applications per season.

(6) - Tank mix with 1.25 L/ha of Bravo or 1.25 kg/ha of Dithane DG [or 935 g ai/ha equivalent mancozeb]

(7) - Maximum number of applications per year is 10. To reduce the potential of fungicide resistance, do not apply more than 3 consecutive applications of Allegro before alternating to a fungicide with a different mode of action.

(8) - Metalaxyl products also have label recommendations for suppression of Pink Rot and Pythium Leak. Experience has shown the metalaxyl-insensitive strains of Phytophthora may develop. Metalaxyl products should not be usec when late blight is present in fields.

(9) - Maximum number of applications per year is 6. To reduce the potential of rungicide resistance, avoid consecutive applications of Scala

(10) - If a buffer zone measurement is not listed, a minimum of 10 M would apply from the edge of a treated field to the edge of an aquatic system

SPROUT INHIBITORS

Sprout inhibitors provide a rather inexpensive means of keeping potatoes in good condition for the late fresh and processing markets. Sprouts increase water loss from tubers and reduce the volume of saleable potatoes. Sprouting may cause color loss in processing potatoes.

When sprout inhibitors are used as directed, tuber residues are below tolerance levels and there are no harmful effects on humans.

PRODUCT	METHOD OF APPLICATION	COMMENTS
Maleic Hydrazide (Royal MH 60SG)	Applied at 3.39 kg active (5.65 kg product) per hectare in a minimum of 300 L/ha water with ground equipment. No storage restrictions for seed potatoes exist with Maleic Hydrazide treated potatoes.	Time of application is critical. **Follow label instructions carefully.**
(Royal MH 30 Xtra)	Applied at 2.86 L active (12.6 L product) per hectare in a minimum of 300 L/ha water with ground equipment.	Time of application is critical. **Follow label instructions carefully.**
Chlorpropham (CIPC) (Fog Application)	Applied in storage after curing and suberization are complete. Cannot be used in a storage containing seed potatoes. Seed cannot be safely stored in a treated storage within 3 years of treatment.	**In-storage application is available only from a manufacturer's representative.** Effectiveness can be reduced by dirty potatoes, poor air distribution and advanced physiological age. Consult your applicator.
Chlorpropham (Sprout-Nip E.C.)	Emulsifiable food grade formulation of chlorpropham used after storage. Mixed with water and misted on potatoes during the grading operation. Prepare a 1% emulsion by adding 1 litre of Sprout-Nip E.C. (350g active) to 35 litres water. Apply emulsion at 1.0 litres per tonne.	Used to control sprouting during retailing and home storage by the consumer. **Potatoes must be clean and all bruises and cuts healed.** Dirt may prevent chemical from reaching the potato eyes. **Follow label instructions carefully** in regards to application equipment, mixing directions and application rates.

- **Never use sprout inhibitors in a seed storage.**
- **Never store treated potatoes in a seed storage.**
- **Never use treated potatoes for seed.**

TOPKILLERS

Chemical Name	Product Name	Formulation	Product/ha	Acute Hazard Rating Mammals	Reentry Times (hrs)
Carfentrazone-ethyl	**Aim EC**	EC	**73 - 350 ml/ha**	LH	**48**
Diquat	**Reglone 240** (240g/L)	SN	- Heavy green vines — 3.5 L/Ha - Medium vines, maturing — 1.7-2.3 L/ha - Split application –1.25-2.3 L/ha + 1.25 L/ha, 4-6 days later	MH	24
Use the higher rate on green immature, dense or rapidly growing tops.			Use a lower rate on tops showing some maturity yellowing or senescence.		
Endothall	**Des-i-cate** (62g/L)	SN	17 - 22 L/ha	MH	48

NOTES ON TOPKILLERS

AIM EC - If a second burndown application is required for potatoes, use Reglone at the rates listed on label. Applications should be made in sufficient water volumes to provide complete coverage of the foliage. Apply in a minimum of 100 L of spray volume per hectare. Use higher spray volumes when there is a dense crop canopy. A surfactant is also required, either Agral 90/Ag-Surf at 0.25% v/v (0.25 L per 100 L of spray solution) or Merge at 1 % v/v (1 L per 100 L of spray solution). Herbicide activity is optimized when applied to actively growing plants. Under warm, moist conditions, symptoms may be accelerated. While under very dry conditions, the expression of herbicide symptoms may be reduced as plants hardened off by drought are less susceptible. If a second desiccant application is required for potatoes, use diquat at rates listed on label. This product is also registered for use as a pre-plant burn-down application or as a row-middle application with a hooded sprayer.

DIQUAT is the active chemical in **Reglone 240**. Applications should be made after growth has passed its peak, rather than when plants are growing actively.
Apply **Diquat** in 560-1100 litres of water per hectare (Label Direction). Do not apply **Diquat** during drought conditions, wait for at least three days after the soil has been thoroughly moistened by rain or irrigation. Use clear water with diquat as it is deactivated by clay or organic particles.
Laboratory tests show that diquat (Reglone 240) is stable and compatible with the following fungicides: Dithane DG, Polygram DF, Bravo Flowable, Manzate 200DF and copper sulphate. Do not use any wetters (Agral 90) or stickers in Eastern Canada.

ENDOTHALL is the active ingredient in **DES-I-CATE**. For light vine growth apply 17 - 22 L/ha of **DES-I-CATE** using the higher rate in cloudy, cool weather. For heavy vine growth use the full rate of 22 L/ha and spray to thoroughly wet the lower stems. For best results, use a sprayer pressure of 700-1050 kPa using 500 - 800 L of water /ha. Applications should be made 10-14 days prior to harvest. Add **DES-I-CATE** to the spray tank after adding water to reduce foaming.

In situations involving very heavy vine growth, double spraying, first up and then down the field on the same day, applying 11 L/ha per application, will maximize coverage and top desiccation. No wetting agent or emulsifier is needed with **DES-I-CATE**. Under conditions favourable for rapid vine growth, such as low soil moisture or high temperature, do not use the high rate as stem end discolouration may occur.

POST HARVEST FUNGICIDES

These fungicides are effective only when the **TOTAL SURFACE** of each tuber is covered and recommended rates are used.

Confine
Confine is a post harvest treatment for russet – skinned potatoes and potatoes intended for processing for the suppression of Late Blight (*Phytophthora infestans*) and Pink Rot (*Phytophthora erythroseptica*) storage infection. Dilute Confine at a 1:4.3 ratio with water. Apply 2 litres of this solution as a spray to 1000 kg of potatoes prior to storage. Ensure complete and even coverage. Confine contains 45.8 % phosphorous acid.

Phostrol
Phostrol Fungicide controls late blight (*Phytophthora infestans*) and pink rot (*Phytophthora erythroseptica*) on stored potatoes.
Apply .42 L in 2 L of water and apply to 1 tonne of potatoes**.** Apply directly to tubers and ensure complete and even coverage.

Rampart
Rampart Fungicide controls late blight (*Phytophthora infestans*) and pink rot (*Phytophthora erythroseptica*) on stored potatoes.
A maximum of one application of RAMPART Fungicide per year may be made, either as a single spray or rinse to harvested potato tubers prior to storage or as a single application through the humidification system to potatoes in storage. Apply Rampart Fungicide as soon as possible after harvest.
Application prior to storage of potato tubers:
Dilute 190 mL of Rampart Fungicide in 1 litre of water. Apply 2 litres of this solution as a spray or rinse to 1000 kg of harvested potato tubers prior to storage.

Mertect SC
Apply Mertect (thiabendazole) as a mist spray on **WHOLE** potatoes going into storage to control the fungal diseases caused by *Fusarium*, *Phoma*, *Rhizoctonia*, and the diseases Silver Scurf and Skin Spot. Add 7.5 litres of Mertect to 170 litres of water. Apply this suspension at the rate of 2 litres per 1000 kg of potatoes. This treatment is effective only when the recommended rate is used. Improper use can result in development of resistant strains of fungal pathogens of potatoes.

Mertect SC can also be applied at the same application rate when potatoes are being moved, as fungal pathogens are present on grading equipment and mechanical injuries will create an entry point for fungal diseases.

CAUTION: DO NOT combine Mertect SC with chlorinated compounds. DO NOT use after sprout initiation. Some resistant strains of Fusarium Rot and Silver Scurf pathogens are now present in the region, reinforcing the need to use recommended rates and application methods.

Oxidate (Biosafe)
Oxidate is used for the control of Fusarium Tuber Rot, Silver Scurf and Bacterial Soft Rot. Applied to potatoes going into storage, mix 100 ml of oxidate per 10 L of water. Use 4.15 - 8.3 L of water per tonne of potatoes. Spray diluted solution on tuber to runoff to achieve full and even coverage.
Additional applications to potatoes in storage can be made daily, as a direct injection into the humidification water.

GUIDELINES FOR CHEMICAL PESTICIDE SAFETY

Treat all pesticides (insecticides, herbicides, fungicides, etc.) as poisonous substances and handle them with great caution. They can kill.

1. Read each pesticide label carefully and follow the instructions. The instructions on a pesticide label serve to safeguard the health of the user as well as to ensure the pesticide is employed as efficiently and economically as possible. When in doubt, read the label.

2. Except where product labels read otherwise, nitrile gloves are recommended. Always refer to product label.

3. Always wear the recommended protective clothing and safety equipment. Pesticides may enter the user's body through the skin, the mouth or by inhalation. The protective equipment worn by the conscientious pesticide applier includes a respirator orgas mask, a wide-brimmed hat, goggles, a shirt with long sleeves over gloves, overalls with rubber bands around the cuff, and neoprene or rubber boots. Because fumigants are readily absorbed by neoprene, be sure to follow label instructions. Don't follow someone else's bad example. Wear the required safety equipment. It's for your own good.

4. Open, pour, weigh and mix pesticides in a safe manner and according to label instructions. Use the proper tools to open a container. Stand upwind of all opening, pouring and mixing operations, and in a well-ventilated area. Avoid splashing and spilling.

5. Learn to recognize the typical signs of poisoning and the correct first aid procedures. Keep a first aid kit handy. Some symptoms of acute poisoning are nausea, diarrhea, loss of muscle coordination, stomach cramps, mental confusion, etc.

6. If you feel ill during pesticide application, stop work and seek medical attention at once. Do not carry on because of the work schedule. Always save the pesticide container or the label to assist the medical aid person. Do not permit any person including yourself, to work alone when handling or applying pesticides.

7. Never use your mouth to siphon liquid materials or to blow out a clogged spray nozzle.

8. Keep people and animals away from contaminated equipment and areas until decontamination procedures are complete.

9. Be sure a good supply of lime, sawdust, or other absorbent is available on site to soak up a spilled pesticide.

10. Do not permit anyone unfamiliar with chemical safety practices to carry out cleaning or maintenance procedures. Appropriate protective equipment is necessary for cleaning and maintenance personnel.

11. Always dispose of irreparable faulty protective equipment and contaminated clothing.

12. Do not store pesticides near any food or drink. Store them in a locked, well-marked area and out of the reach of children.

13. Do not keep any food, drink, tobacco, cups or cutlery anywhere in the work areas or work clothes. Refrain from smoking, eating, or drinking while mixing or applying pesticides.

14. Dispose of empty pesticide containers by removal of caps and labels, triple rinse and return to your crop protectant dealer. **Triple Rinse:** Containers should be thoroughly rinsed at least three times with the rinsing being added to the spray mix. The landfill sites at Wellington and the Energy Waste Plant in Charlottetown will accept clean paper chemical bags. A permit is required and there is a charge of $25.00. Contact Debbie Johnson (368-5059) or Glenda Peters (368-5047) for a permit.

15. After handling pesticides, wash hands carefully before eating, drinking, smoking, or using the toilet.

16. Shower thoroughly, with special attention to hair and fingernails, after each pesticide application is complete. Change clothes daily or more often if any contamination occurs. Wash contaminated clothing separately from normal laundry.

17. Before mixing and applying pesticides, clear all livestock, pets and people from the area to be treated. Apply pesticides only at the correct time and under acceptable weather conditions.

18. Check the application equipment. Look for leaking hoses, or connections, plugged or worn nozzles, and examine the seals on the filter openings to make sure they will prevent pesticide spillage.

19. Mix the pesticide at the recommended rate, and apply at the specific dosage on the label. Carry only a sufficient quantity of the pesticide for the job at hand.

POISON INFORMATION CENTRES

The hospitals and telephone numbers listed below provide emergency information on potentially toxic substances 24 hours a day. If you suspect poisoning from exposure to a pesticide consult the label for immediate first aid instructions. Transport the person to the nearest hospital and take the label information with you.

Prince Edward Island
IWK Health Centre-Poison Information Centre
Telephone: 1-800-565-8161

Nova Scotia
IWK Grace Poison Information Centre
Telephone: 1-800-565-8161
or Halifax (902) 428-8161

New Brunswick
Telephone: 911 Ask for poison information

ENVIRONMENTAL EMERGENCIES
(Pesticide spills)

New Brunswick, Nova Scotia or Prince Edward Island
1-800-565-1633 (24 hours) or in Halifax (902) 426-6030

THINK SAFETY

PEI Department of Agriculture and Forestry
Potato Quality Section

2013 Disinfection Program

Mobile Disinfection Services - Mobile units respond to requests from various sectors of the potato industry to provide a chemical disinfectant delivery services. All types of potato handling, storage, and transportation equipment are sprayed with a product registered for the control of the bacterial ring rot causing organism. Seasonal variation in the demand for mobile service is accommodated by increasing/decreasing the number of units on call but the program maintains at least five mobile services at all times. Requests for the mobile services are provided through a cell phone system which provides a prompt, efficient service.

Mobile Service:

Area	***Mobile Phone #***
O'Leary	(902) 206-0246
Albany	(902) 438-0245
Charlottetown	(902) 314-0799
Montague	(902) 313-0073
Souris	(902) 208-0253

Stationary Vehicle Disinfection Depot - A year round facility (Borden) provides disinfection services for potato transporters. Provincial legislation requires that all transporters arriving on P.E.I. to load potatoes must be disinfected prior to loading. Where it is not convenient for trucks to receive disinfection services at a depot, mobile units are called to meet the vehicle somewhere mutually convenient. There is a fee of $10.00 + HST for the disinfection of transport trucks payable on exiting the Province.

Disinfection Station:		***Phone #***
Borden-Carleton	Borden-Carleton (Industrial Park)	(902) 437-8559

Disinfectant

Chemical	Product	Concentration	Hazard	Caution
Dimethyl Benzyl Ammonium Chloride	General Storage Disinfectant Ag Services Inc.	6 ml/L water	VLH	avoid skin and eye contact an inhalation of mist

METRIC CONVERSION FACTORS FOR ENGLISH SYSTEM

Metric units ÷ Approximate conversion factor = Results in:

LINEAR			**TEMPERATURE**		
Millimeter (mm)	÷ 25	inch	Degrees Celsius (°C)	(9/5x°C)+32	degrees Fahrenheit
Centimetre (cm)	÷ 30	foot			
Metre (m)	÷ 0.9	yard	**PRESSURE**		
Kilometre (km)	÷ 1.6	mile	Kilopascal (kPa)	÷ 6.9	pounds per square inch
AREA			**POWER**		
Sq. centimetre (cm^2)	÷ 6.5	square inch	Watt (W)	÷ 746	horsepower
Sq. metre (m^2)	÷ 0.09	square inch	Kilowatt (kW)	÷0.75	horsepower
Hectare (ha)	÷ 0.40	acre			
			SPEED		
VOLUME			Metres per second (m/s)	÷ 0.30	feet per second
Cubic centimetre (cm^3)	÷ 16	cubic inch	Kilometres per hr. (km/h)	÷ 1.6	miles per hour
Cubic decimetre (dm^3)	÷ 29	cubic foot			
Cubic metre (m^3)	÷ 0.8	cubic yard	**AGRICULTURE**		
Millilitre (mL)	÷ 28	fluid ounce	Hectolitres/hec. (hl/ha)	÷ 0.90	bushels per acre
Litre (L)	÷ 0.57	pint	Litres per hec. (L/ha)	÷ 11.23	gallons per acre
Litre (L)	÷ 1.1	quart	Litres per hec. (L/ha)	÷ 2.8	quarts per acre
Litre (L)	÷ 4.5	gallon	Litres per hec. (L/ha)	÷ 1.4	pints per acre
Hectolitre (hL)	÷ 0.36	bushel	Milliliters/hec. (mL/ha)	÷ 70	fluid ounces per acre
Litres/sec./tonne	÷ 10.4	cubic feet/min./cwt.	Tonnes per hec. (t/ha)	÷ 2.24	tons per acre
			Kilograms per hec. (kg/ha)	÷ 1.12	pounds per acre
WEIGHT			Grams per hec. (g/ha)	÷ 70	ounces per acre
Gram (g)	÷ 28	ounce	Plants per hec. (plants/ha)	÷ 2.47	plants per acre
Kilogram (kg)	÷ 0.45	pound			
Tonne (t)	÷ 0.9	ton	Examples:		
Tonne (t)	÷ 0.0454	hundredweight (cwt)	3 km ÷ 1.6 = 1.9 miles		
			4 ha ÷ 0.4 = 10 acres		
			13.5 hl/ha ÷ 0.90 = 15 bushels per acre		

WARNING

Please note that we make no warranty or guarantee of any kind, expressed on implied, concerning the use of products listed in this publication. The user assumes all risk, whether recommendations are followed or not.

This publication is intended as a guide only.
For specific product information

ALWAYS REFER TO AND FOLLOW DIRECTIONS ON THE LABEL.