

POTATO CROP WEED AND PEST CONTROL

**NEW BRUNSWICK
2023**



Department of Agriculture, Aquaculture and Fisheries

Potato Development Centre	
39 Barker Lane Wicklow, N.B E7L 3S4	Toll-free:1-866-778-3762 Tel: (506) 392-5199 Fax: (506) 392-5102
Web address:	https://www2.gnb.ca/content/gnb/en/departments/10/agriculture.html

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
VL	Very Low Toxicity	Above 500	Above 2	Above 2000	Above 8
LT	Low Toxicity	101-500	0.41-2	401-2000	6-7.99
MT	Moderate Toxicity	21-100	0.21-0.4	201-400	4-5.99
VHT	Very High Toxicity	11-20	0.081-0.2	81-200	2-3.99
ET	Extreme Toxicity	10 and less	0.08 and less	80 and less	1.99 and less

PESTICIDES ABBREVIATIONS

DF dry flowable	g gram	mL millilitre
DP dispersible powder	GR granular	SC spray concentrate
DU dust	ha hectare	SN solution
EC emulsifiable	kg kilogram	SP soluble powder
EW water base	kPa kilopascal	SU suspension
FC flowable concentrate	L litre	SURF surfactant
FLOW flowable liquid	mg milligram	WP wetttable powder

GUIDELINES FOR CHEMICAL PESTICIDE SAFETY

1. Carefully read and follow pesticide label instructions, which serve to protect the user and ensure pesticides are used efficiently and economically.
2. Always wear nitrile gloves when mixing pesticides unless otherwise stated on the label. Always refer to product label.
3. Always wear recommended protective clothing and safety equipment as pesticides can enter the user's body through the skin, mouth or by inhalation. The protective equipment worn by the applicator includes a respirator or gas mask, a wide-brimmed hat, goggles, a shirt with long sleeves and cuff, also long-sleeved gloves with cuffs, overalls with rubber bands around the cuff and neoprene or rubber boots. Fumigants are readily absorbed by neoprene; therefore, follow label instructions.
4. Open, pour, weigh, and mix pesticides in a safe manner according to label instructions. Use proper tools to open a container. Stand upwind and in a well-ventilated area when opening, pouring and/or mixing pesticides. Avoid splashing and spilling.
5. Learn to recognize typical signs of poisoning. Some symptoms of acute poisoning include nausea, diarrhea, loss of muscle coordination, stomach cramps, mental confusion etc. Ensure that one person at each jobsite has updated first aid training and maintain a first aid kit nearby in areas where pesticides are handled.
6. If you feel ill during pesticide application, seek immediate medical attention. Always save the pesticide container and label to assist the medical staff with treatment.
7. Never work alone when handling or applying pesticides.
8. Never use your mouth to siphon liquid materials or to blow out clogged spray nozzles.
9. Keep people and animals away from contaminated equipment and areas until decontamination procedures are complete.
10. Ensure an adequate supply of lime, sawdust, or other absorbent is available on-site to absorb spilled pesticide. Dispose of absorbed material in an area approved for hazardous waste.
11. Do not permit anyone unfamiliar with chemical safety practices to carry out cleaning or maintenance procedures. Appropriate protective equipment is mandatory for cleaning and maintenance personnel.
12. Always dispose of irreparable or faulty protective equipment and contaminated clothing.
13. Do not store pesticides near food or drink. Pesticides should be stored in a locked, well-marked area and out of the reach of children.
14. Do not keep food, drink, tobacco, cups, cutlery or work clothes in the work areas. Refrain from smoking, eating, or drinking while mixing and/or applying pesticides.
15. Empty plastic pesticide containers should be rinsed three times with water with about 10% of the volume of the container per rinse or rinse for approximately 1 minute using a jet rinser. The rinsate should be put into the spray tank as part of the makeup water. The container should be punctured or rendered unusable and taken to a container recycling site. For information regarding recycling sites, please contact any pesticide vendor. Paper or plastic bags should be shaken out well, rinsed if possible, and placed in a labelled black garbage bag. Labels should identify the contents of the garbage e.g. "clean and emptied pesticide bags". Bags should be transported by the grower to the local regional landfill site or transfer station.

For disposal recommendations, please contact any member of the Pesticide Unit at (506) 453- 7945 or at pesticides@gnb.ca. *(Information courtesy the NB Department. of Environment)*

16. After handling pesticides, wash hands carefully before eating, drinking, smoking, or using the washroom.

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

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

19. Inspect application equipment. Look for leaking hoses, connections, plugged or worn nozzles, and examine the seals on filter openings to ensure they will prevent pesticide spillage.

20. Mix and apply pesticides at the recommended label rate. Carry only enough pesticide for the job at hand.

INTEGRATED PEST MANAGEMENT

Although the management of insect pests on potatoes continues to rely heavily on synthetic insecticides, the continued usefulness of these products will be enhanced and extended by the concurrent use of cultural and alternative control methods. All insecticides listed in this guide will control some potato insect pests. Therefore, when choosing a chemical control product, differences in their respective modes of action, persistence, sensitivity to temperature and pest specificity must be considered.

Many of the products listed in this guide are toxic to bees, other important pollinators and beneficial species. To further minimize exposure to pollinators and beneficial species, refer to the complete guidance “Protecting Pollinators during Pesticide Spraying – Best Management Practices” on the Health Canada website (www.healthcanada.gc.ca/pollinators).

An Integrated Pest Management Strategy can be readily built upon the following principles:

- Monitoring – What pests are present and in what numbers
- Avoidance – Cultural practices that avoid or resist pest impact
- Prevention – Cultural practices that keep pests out
- Suppression – Reduce pest populations below economic impact levels

MONITORING

The important aspects of any decision-making component of a pest management program is to know the status of pest populations and pest pressures upon the crop. Monitor each field on a regular and recurring basis to identify the insect pests present and to determine their populations at different life stages. Keep in mind that the previous crop, cropping practices and type of vegetation surrounding the field affect the presence and development of insect populations. Information on the changes in insect pest populations in your region can be obtained from a variety of pest forecasting and monitoring services offered by both the public and the private sectors. Use of the information gathered will help to develop a season long pest control program or to respond to a specific pest outbreak.

AVOIDANCE

Planting clean seed and following sound agronomic practices contribute to an IPM program by reducing or avoiding problems before they occur. Field rotation is a key element of this approach. Rotate fields frequently and isolate potato fields whenever possible. This delays field colonization by over-wintering insects and reduces their abundance in the crop. Increasing the distance between old and new fields of potatoes has a direct correlation to decreasing Colorado Potato Beetle infestation.

PREVENTION

Prevention practices include roguing to reduce inoculum levels, the use of oil sprays and border crops to prevent non-persistent virus transmission and early top-kill to reduce canopy exposure to pests. These, and other similar methods, will prevent or reduce the risk of contracting problems from pests.

SUPPRESSION

Suppressive pest-control methods are used to reduce pest population levels. The methods chosen usually do not eliminate all pests, but reduce their populations to a tolerable level or to a point below an economic injury level; additional suppressive measures may be required if the first attempt does not achieve the management goal.

POTATO FOLIAR FUNGICIDES 2023

COMMERCIAL NAME	ACTIVE INGREDIENT(S)	GROUP 1	DISEASES								
			BLACK DOT	BOTRYTIS VINE ROT	BROWN LEAF SPOT	EARLY BLIGHT	LATE BLIGHT	LEAK	PINK ROT	LATE BLIGHT ON TUBERS	WHITE MOLD
			<i>Colletotrichum coccodes</i>	<i>Botrytis cinerea</i>	<i>Alternaria alternata</i>	<i>Alternaria solani</i>	<i>Phytophthora infestans</i>	<i>Pythium</i> spp.	<i>Phytophthora erythroseptica</i>	<i>Phytophthora infestans</i>	<i>Sclerotinia sclerotiorum</i>
Acapela	Picoxystrobin	11	-	-	-	X	X	-	-	-	X
Allegro 500 F	Fluazinam	29	-	-	-	-	X	-	-	-	X
Aprovia™ Top	Benzovindiflupyr Difenoconazole	7, 3	-	-	X	X	-	-	-	-	-
Azoshy 250 SC	Azoxystrobin	11	X	-	-	X	X	-	-	-	-
Bravo® ZN	Chlorothalonil	M	-	X	-	X	X	-	-	-	-
Cantus® WDG	Boscalid	7	-	-	-	X	-	-	-	-	-
Cevya	Mefentrifluconazole	3	X	-	X	X	-	-	-	-	-
Confine™ EXTRA	Phosphorous acid	33	-	-	-	-	X	-	X	X	-
Copper 53 W	Tribasic copper	M	-	-	-	X	X	-	-	-	-
Copper Spray	Copper oxychloride	M	-	-	-	X	X	-	-	-	-
Coppercide WP	Copper hydroxide	M	-	-	-	X	X	-	-	-	-
Cueva®	Copper octanoate	M	-	-	-	X	X	-	-	-	-
Curzate™	Cymoxanil	27	-	-	-	-	X	-	-	-	-
Diplomat 5SC	Polyoxin D Zinc Salt	19	-	-	-	X	-	-	-	-	-
Dithane™ Rainshield™	Mancozeb	M	-	-	-	X	X	-	-	-	-

COMMERCIAL NAME	ACTIVE INGREDIENT(S)	GROUP 1	DISEASES								
			BLACK DOT	BOTRYTIS VINE ROT	BROWN LEAF SPOT	EARLY BLIGHT	LATE BLIGHT	LEAK	PINK ROT	LATE BLIGHT ON TUBERS	WHITE MOLD
			<i>Colletotrichum coccodes</i>	<i>Botrytis cinerea</i>	<i>Alternaria alternata</i>	<i>Alternaria solani</i>	<i>Phytophthora infestans</i>	<i>Pythium</i> spp.	<i>Phytophthora erythroseptica</i>	<i>Phytophthora infestans</i>	<i>Sclerotinia sclerotiorum</i>
Double Nickel LC/55™	<i>Bacillus amyloliquefaciens</i>	44	-	-	-	X	-	-	-	-	X
Downforce AG	Fluazinam	29	-	-	-	-	X	-	-	-	X
Echo 720	Chlorothalonil	M	-	X	-	X	X	-	-	-	-
Echo 90 DF	Chlorothalonil	M	-	X	-	X	X	-	-	-	-
Elatus	Azoxystrobin. Benzovindiflupyr	11, 7	X	-	-	X	-	-	-	-	-
Elixir™	Mancozeb Chlorothalonil	M	-	-	-	X	X	-	-	-	-
Evito 480SC	Fluoxastrobin	11	X	-	-	X	X	-	-	-	-
Fixed Copper Fungicide	Copper oxychloride	M	-	-	-	X	X	-	-	X	-
Forum™	Dimethomorph	40	-	-	-	-	X	-	-	X	-
Gavel® 75 DF	Zoxamide Mancozeb	22, M	-	-	-	X	X	-	-	-	-
Headline® EC	Pyraclostrobin	11	-	-	-	X	X	-	-	-	-
Kocide® 2000	Copper hydroxide	M	-	-	-	X	X	-	-	X	-
Luna Tranquility®	Fluopyram Pyrimethanil	7, 9	X	-	X	X	-	-	-	-	X
Manzate DF/Pro-Stick	Mancozeb	M	-	-	-	X	X	-	-	-	-
Manzate MAX	Mancozeb	M	-	-	-	X	X	-	-	-	-
Miravis Duo	Difenoconazole Pydiflumetofen	3, 7	-	X	X	X	-	-	-	-	X
MPOWER Spade	Pyraclostrobin	11	-	-	-	X	X	-	-	-	-
Orondis™ Ultra	Oxathiapiprolin Mandipropamid	49, 40	-	-	-	-	X	-	-	-	-

COMMERCIAL NAME	ACTIVE INGREDIENT(S)	GROUP 1	DISEASES								
			BLACK DOT	BOTRYTIS VINE ROT	BROWN LEAF SPOT	EARLY BLIGHT	LATE BLIGHT	LEAK	PINK ROT	LATE BLIGHT ON TUBERS	WHITE MOLD
			<i>Colletotrichum coccodes</i>	<i>Botrytis cinerea</i>	<i>Alternaria alternata</i>	<i>Alternaria solani</i>	<i>Phytophthora infestans</i>	<i>Pythium</i> spp.	<i>Phytophthora erythroseptica</i>	<i>Phytophthora infestans</i>	<i>Sclerotinia sclerotiorum</i>
Parasol Flowable	Copper hydroxide	M	-	-	-	X	X	-	-	X	-
Parasol WG	Copper hydroxide	M	-	-	-	X	X	-	-	X	-
Parasol WP	Copper hydroxide	M	-	-	-	X	X	-	-	X	-
Pencozeb 75 DF Raincoat	Mancozeb	M	-	-	-	X	X	-	-	-	-
Phostrol™	Phosphorous acid	33	-	-	X	X	X	-	X	-	-
Polyram® DF	Metiram	M	-	-	-	X	X	-	-	-	-
Presidio™	Flupicolide	43	-	-	-	-	X	-	X	X	-
Propulse	Fluopyram Prothioconazole	7, 3	X	-	X	X	-	-	-	-	X
Quadris® F	Azoxystrobin	11	X	-	-	-	-	-	-	-	-
Quadris® Top™	Azoxystrobin Difenconazole	3, 11	X	-	X	X	-	-	-	-	X
Quash®	Metconazole	3	-	-	-	X	-	-	-	-	X
Rampart®	Phosphorous acid	33	-	-	-	-	X	-	X	-	-
Ranman 400 SC	Cyazofamid	21	-	-	-	-	X	-	-	X	-
Reason® 500 SC	Fenamidone	11	-	-	-	X	X	-	-	-	-
Revus®	Mandipropamid	40	-	-	-	-	X	-	-	-	-

COMMERCIAL NAME	ACTIVE INGREDIENT(S)	GROUP 1	DISEASES								
			BLACK DOT	BOTRYTIS VINE ROT	BROWN LEAF SPOT	EARLY BLIGHT	LATE BLIGHT	LEAK	PINK ROT	LATE BLIGHT ON TUBERS	WHITE MOLD
			<i>Colletotrichum coccodes</i>	<i>Botrytis cinerea</i>	<i>Alternaria alternata</i>	<i>Alternaria solani</i>	<i>Phytophthora infestans</i>	<i>Pythium</i> spp.	<i>Phytophthora erythroseptica</i>	<i>Phytophthora infestans</i>	<i>Sclerotinia sclerotiorum</i>
Ridomil® Gold/Bravo® Twin Pak	Metalaxyl-m Chlorothalonil	4 M	-	X	-	X	X	X	X	X	-
Scala® SC	Pyrimethanil	9	-	-	-	X	-	-	-	-	-
Sercadis®	Fluxapyroxad	7	-	-	-	X	-	-	-	-	X
Serenade® Opti™	<i>Bacillus subtilis</i>	44	-	-	-	X	-	-	-	-	X
Tanos™	Cymoxanil Famoxadone	11, 27	-	-	-	X	X	-	-	-	-
Timorex Gold	Tea Tree Oil		-	-	-	-	X	-	-	-	-
Vertisan™	Penthiopyrad	7	-	X	-	X	-	-	-	-	-
Zampro®	Ametoctradin Dimethomorph	40, 45	-	-	-	-	X	-	-	X	-

- Product not registered for use against the particular disease.

X = Product registered for use against particular disease.

¹ Classification according to fungicide mode of action.

COMMERCIAL NAME	ACTIVE INGREDIENT(S)	GROUP 1	PRE-HARVEST INTERVAL (Days)	RESTRICTED ENTRY INTERVAL (Hours)	HAZARD RATING	
					HUMANS	FISH
Acapela	Picoxystrobin	11	3	12	VLT	VHT
Allegro 500 F	Fluazinam	29	14	24	VLT	VHT
Aprovia™ Top	Benzovindiflupyr Difenoconazole	7 3	14	12	LT	VHT
Azoshy 250 SC	Azoxystrobin	11	1	WFD	VLT	VHT
Bravo® ZN	Chlorothalonil	M	2	**	VLT	VHT
Cantus® WDG	Boscalid	7	30	4/WFD	VLT	VHT
Cevya	Mefentrifluconazole	3	7	12	VLT	VHT
Confine™ EXTRA	Phosphorous acid	33	1	12	VLT	MT
Copper 53 W	Tribasic copper	M	2	48	VLT	VHT
Copper Spray	Copper oxychloride	M	2	48	VLT	VHT
Coppercide WP	Copper hydroxide	M	1	WFD	VLT	VHT
Cueva®	Copper octanoate	M	1	4	VLT	VHT
Curzate™	Cymoxanil	27 M	8	24	VLT	LT
Diplomat 5SC	Polyoxin D Zinc Salt	19	0	WFD	VLT	HT
Dithane Rainshield™	Mancozeb	M	1	WFD	VLT	MT
Double Nickel LC/55™	<i>Bacillus amyloliquefaciens</i>	44	0	WFD	VLT	VLT
Downforce AG	Fluazinam	29	14	1	VLT	VHT
Echo 720	Chlorothalonil	M	1	48a	VLT	VHT
Echo 90 DF	Chlorothalonil	M	1	48a	VLT	VHT
Elatus	Azoxystrobin Benzofindiflupyr	11	14	12	VLT	VHT
Elixir™	Mancozeb Chlorothalonil	M	1	48	VLT	MT
Evito 480SC	Fluoxastrobin	11	1	12	VLT	VHT
Fixed Copper Fungicide	Copper oxychloride	M	2	48	VLT	VHT
Forum™	Dimethomorph	40	4	12	VLT	MT

COMMERCIAL NAME	ACTIVE INGREDIENT(S)	GROUP 1	PRE-HARVEST INTERVAL (Days)	RESTRICTED ENTRY INTERVAL (Hours)	HAZARD RATING	
					HUMANS	FISH
Gavel® 75 DF	Zoxamide Mancozeb	22 M	3	48	VLT	MT
Headline® EC	Pyraclostrobin	11	3	12	VLT	VHT
Kocide® 2000	Copper hydroxide	M	1	WFD	VLT	VHT
Luna Tranquility®	Fluopyram Pyrimethanil	7, 9	7	12	VLT	LT
Manzate® DF/Pro-Stick™	Mancozeb	M	1	WFD	VLT	MT
Manzate® MAX	Mancozeb	M	1	WFD	VLT	MT
Miravis Duo	Pydiflumetofen Difenoconazole	3, 7	14	12	VLT	VHT
MPOWER Spade	Pyraclostrobin	11	3	48	MT	VHT
Orondis Ultra	Oxathiapiprolin Mandipropamid	49, 40	14	12	MT	HH
Parasol Flowable	Copper hydroxide	M	1	WFD	VLT	VHT
Parasol WG	Copper hydroxide	M	1	WFD	VLT	VHT
Parasol	Copper hydroxide	M	1	WFD	VLT	VHT
Penncozeb 75 DF Raincoat™	Mancozeb	M	1	24a	VLT	MT
Phostrol™	Phosphorous acid	33	0	12	VLT	MT
Polyram® DF	Metiram	M	1	WFD	VLT	VHT
Presidio™	Flupicolide	43	7	12	LT	VHT
Propulse	Fluopyram Prothioconazole	7, 3	14	1	LT	VHT
Quadris® F	Azoxystrobin	11	1	WFD	VLT	VHT
Quadris® Top™	Azoxystrobin Difenoconazole	3, 11	14	WFD	VLT	VHT
Quash®	Metconazole	3	1	12	VLT	MT
Rampart®	Phosphorous acid	33	1	4	VLT	MT
Ranman 400 SC	Cyazofamid	21	7	12	VLT	MT
Reason® 500 SC	Fenamidone	11	14	WFD	VLT	VHT
Revus®	Mandipropamid	40	14	12	VLT	MT
Ridomil® Gold MZ 68 WP	Metalaxyl-m Mancozeb	4 M	3	24	VLT	MT

COMMERCIAL NAME	ACTIVE INGREDIENT(S)	GROUP 1	PRE-HARVEST INTERVAL (Days)	RESTRICTED ENTRY INTERVAL (Hours)	HAZARD RATING	
					HUMANS	FISH
Ridomil Gold/Bravo® Twin Pak	Metalaxyl-m Chlorothalonil	4 M	14	24	VLT	VHT
Scala	Pyrimethanil	9	7	24	VLT	VHT
Sercadis®	Fluxapyroxad	7	7	12	VLT	VHT
Serenade® Opti™	<i>Bacillus subtilis</i>	44	0	WFD	VLT	VLT
Tanos™ 50 DF	Cymoxanil Famoxadone	11, 27	14	24	VLT	VHT
Timorex Gold	Tea Tree Oil		1	WFD	VLT	MT
Vertisan™	Penthiopyrad	7	7	12	VLT	VHT
Zampro®	Ametoctradin Dimethomorph	40, 45	4	12	VLT	MT

¹ Classification according to fungicide mode of action.

**** Individuals may re-enter treated areas for short-term tasks not involving hand labor if at least 12 hours have passed since application, 3 days for scouting, 19 days for roguing.**

Acapela - Begin applications, 0.6-1 L/ha, prior to disease development and continue on a 7 to 10-day interval. Use higher rate and shorter interval when disease pressure is high. Maximum total seasonal use rate is 2.63 L/ha.

Allegro 500 F-For late blight, apply at 0.4 L/ha when plants are 15-20 cm high or when conditions favor disease development. Repeat application at 7-10 days interval. Do not exceed 3 sequential applications before alternating to a fungicide with a different mode of action. Apply no more than 10 applications per season. For white mould, begin applications at full bloom. Repeat applications on a 7-10 day schedule. When white mould pressure is low to moderate, use 0.4 L/ha. When conditions favor moderate to high white mould pressure, increase the rate to 0.6 L/ha. Do not exceed 3 sequential applications before alternating to a fungicide with a different mode of action. Apply no more than 4.0 L/ha per season.

Aprovia™ Top-Maximum Residue Limits have not been established outside of NAFTA as of February 2017. Prior to applications, growers are advised to check with their potato buyers regarding Aprovia™ Top use. Apply at 0.643-0.967 L/ha. For control of early blight and suppression of brown spot begin applications prior to disease development and continue throughout the season on a 7-14 day interval. If disease pressure is high, use the highest rate and shortest interval. Make no more than 2 consecutive applications before switching to a non-group 3 and 7 fungicide. If applications are made by one method (ground or air) all consecutive applications must be made by the same method. Apply no more than 2 applications by air or 4 applications by ground per season.

Azoshy 250 SC-Apply at 0.5-0.8 L/ha on a 7-14 day interval for black dot and early blight. Apply at 0.8 L/ha on a 7-day interval for late blight, starting prior to disease establishment. Where possible, rotate the use of Azoshy 250 SC or other group 11 fungicides with different fungicide groups that control the same pathogens. Apply no more than 2.4 L/ha per season. Do not exceed 3 applications per season.

Bravo® ZN-For early blight apply at 1.6-2.4 L/ha and for late blight apply at 1.2-2.4 L/ha. Begin applications when plants are 15-20 cm high, or when disease threatens. Repeat applications at 7-10 day intervals, or as necessary to maintain disease control. Under severe disease conditions, use the higher rates at 7-day intervals. Where possible, rotate the use of Bravo® ZN or other group M fungicides with different fungicide groups that control the same pathogens. Do not apply more than 24 L/ha per season.

Bravo® ZN plus Ridomil® Gold 480 EC or Ridomil® Gold 480 SL-For the control of foliar late blight, early blight or botrytis vine rot, and suppression of storage rot namely pythium leak and pink rot. The first application at 2 L/ha Bravo® 500 combined with 0.208 L/ha Ridomil® Gold should be applied before row closure. Apply second and third applications at 14 days intervals. Apply a contact fungicide, recommended for the control of late blight, 7 days after each tank-mix. Apply no more than 3 tank-mix applications per season. Do not apply the tank-mix to potato plants later than 14 days before harvest.

Cantus® WDG-Apply at 0.175-0.315 kg/ha. Begin applications prior to disease development and continue on a 14-day interval if conditions continue to be favorable for disease development. Do not apply more than 2 consecutive applications before rotating to another mode of action for at least one spray. Apply no more than 4 applications per season.

Cevya - Begin applications prior to disease development. Apply an additional application at an interval of 7-14 days if disease persists or weather conditions are favourable for disease development. Under high disease pressure and during rapid growth, use the higher rate and shorter spray interval. Do not apply more than 1.125 L/ha per year.

Confine™ EXTRA-Apply at 5-10 L/ha for preventative suppression of late blight and pink rot. Begin applications when conditions become favorable for disease development and continue on a 7-14 day interval. Use the higher rate and shorter application interval when disease pressure is moderate to high. Use a maximum of 5 foliar and/or chemigation applications per growing season in a preventive program for disease suppression. Where possible, rotate the use of Confine™ EXTRA or other group 33 fungicides with different fungicide groups that control the same pathogens. It is not recommended for use on potatoes intended for seed, as sufficient data does not exist to support this use.

Copper 53 W-Apply at 3.8 kg/ha. Begin applications when plants are 12-18 cm high. Repeat applications at 7-10 day intervals. Where possible, rotate the use of Copper 53 W or other group M fungicides with different fungicide groups that control the same pathogens. Apply no more than 10 applications per season. Do not apply by air

Copper Spray-Use 4 kg in 1000L of water per hectare. Spray to ensure thorough coverage of plants. Begin applications when plants are 10-20 cm high. Repeat applications at 7-10 day intervals. Where possible, rotate the use of Copper Spray or other group M fungicides with different fungicide groups that control the same pathogens. Apply no more than 10 applications per season. Do not apply by air.

Coppercide WP-Begin applications when plants are 15 cm high. Repeat applications at 7-10 days interval until harvest. Use at 1.1-2.25 kg/ha, depending on density of foliage, combined with 1.75-2.25 kg/ha of Mancozeb (80% a.i.). Coppercide at 3.4 kg/ha may be applied at vine kill with a desiccant or alone after vine kill prior to harvest. This late treatment may reduce late blight infection of tubers during harvest. Where possible, rotate the use of Coppercide WP or other group M fungicides with different fungicide groups that control the same pathogens. Do not apply by air

Cueva®-Use a 0.5% to 2% solution, applied at 470-940 L/ha. Re-apply using 5-10 day intervals. For best control, begin treatment 2 weeks before disease normally appears or when weather forecasts predict a long period of wet weather. Alternatively, begin treatment when disease first appears and repeat at 5 to 10 day intervals. Apply at the higher rate following heavy rain or when disease pressure is high. Where possible, rotate the use of Cueva® or other group M fungicides with different fungicide groups that control the same pathogens. Apply no more than 15 applications per season. Do not apply by air

Curzate™ -Apply at 0.225 kg/ha tank-mixed with 1.35-1.6 kg/ha of Mancozeb (80% a.i.). Apply by air with a minimum water volume of 50 L/ha. Initial applications should start when local conditions indicate late blight is imminent. Use the higher rate of Mancozeb under conditions of high disease pressure. Apply at 5-7 day intervals, however at least 20 days must pass between the 2nd and 3rd application. Where possible, rotate the use of Curzate® 60 DF or other group 27 or M fungicides with different fungicide groups that control the same pathogens. Apply no more than 4 applications per season.

Diplomat - Apply as a foliar spray in sufficient water to provide thorough coverage of foliage. Begin as a preventative application when conditions favour disease development and continue on a 7-14 day interval as needed to maintain suppression. Do not apply more than 150 g a.i./ha/season.

Dithane™ Rainshield™- Begin applications early; apply 1.10 kilograms Dithane Rainshield Fungicide per hectare when plants are 10-15 cm high. Increase the rate to 1.75 kilograms per hectare as plants increase in size, and to 2.25 kilograms per hectare at row closure. Apply every 7-10 days throughout the season. Do not apply more than 8 applications per year. During periods of wet weather favouring late blight (*Phytophthora infestans*) and/or vigorous crop growth, spray intervals may be reduced to 5-6 days. Apply 1.1 kilograms per hectare until row closure then increase the rate to 1.75 kilograms per hectare until conditions allow the return to the regular spray schedule.

Double Nickel™ LC/55-For the control of early blight, begin applications at the onset of crop cover to the formation of tubers. Repeat application every 3-10 days. Apply 2.5-10 L/ha (1-2 kg/ha) and use shorter interval when disease pressure is moderate to high and plant stage are conducive to rapid disease development. Under low disease pressure or to smaller plants, lower rates may be applied at the rate of 2.5-5 L/ha (0.5-1 kg/ha). For the control of White mold, begin application preventatively when the conditions are favorable for onset of the disease. Repeat application every 3-10 days. Apply 5-12.5 L/ha (1-2.5 kg/ha) using shorter interval when disease pressure is moderate to high and plant stage are conducive to rapid disease development. Under low disease pressure or to smaller plants lower rates may be applied at the rate of 1-5 L/ha (0.2-1 kg/ha). Where possible, rotate the use of Double Nickel™ or other group 44 fungicides with different fungicide groups that control the same pathogens.

Downforce AG - Apply 0.4 l/ha when the plants are 15 – 20 cm tall or when conditions favour disease development. Repeat applications at intervals of 7 – 10 days. White Mould control: Begin applications at full bloom. Repeat applications at intervals of 7 – 10 days. When white mould pressure is low to moderate, use 400 ml. When conditions favour moderate to high white mould pressure, increase the rate to 600 ml. Apply in sufficient water to obtain adequate coverage of foliage. Spray volumes to be used vary with amount of plant growth. Spray volume usually will range from 200 to 600 litres per hectare for ground application. For aerial application, apply in a minimum of 45 litres per hectare. Do not exceed 3 sequential applications before alternating to a fungicide with a different mode of action. Apply no more than 4.0 L/ha per season.

Echo 720-For botrytis vine rot and early blight apply at 1.1 L/ha. For late blight apply at 0.8-1.7 L/ha. Begin applications when plants are 15-20 cm high, or when disease threatens. Repeat applications at 7-10 day intervals, or as necessary to maintain disease control. Under

severe disease conditions, use the higher rates at 7-day intervals. Where possible, rotate the use of Echo 720 or other group M fungicides with different fungicide groups that control the same pathogens.

Echo 90 DF-For botrytis vine rot and early blight apply at 0.9-1.3 kg/ha. For late blight apply at 0.7-1.3 kg/ha. Begin applications when plants are 15-20 cm high, or when disease threatens. Repeat applications at 7-10 day intervals, or as necessary to maintain disease control. Under severe disease conditions, use the higher rates at 7-day intervals. Where possible, rotate the use of Echo 90 DF or other group M fungicides with different fungicide groups that control the same pathogens. Apply no more than 12 applications per season.

Elatus - Begin applications prior to disease development and continue throughout the season on a 7-14 day interval. If disease pressure is high, use the highest rate and shortest interval. For Early Blight, use the high rate and short application interval under high disease pressures. For best results, sufficient water volume must be used to provide thorough coverage. A minimum of 150 L/ha for ground applications is recommended.

Elixir™-Begin application at 1.68 kg/ha when plants are 10-15cm high. Increase the rate to 2.24 kg/ha as the plants increase in size. Apply every 7-10 days throughout the season. Use the shorter spray interval when plants are rapidly growing. Where possible, rotate the use of Elixir™ or other group M fungicides with different fungicide groups that control the same pathogens. Do not apply more than 22.4 kg/ha per season.

Evito™ Apply preventatively as a foliar spray on a 7 to 10-day interval. · If symptoms develop, switch to a fungicide with a different mode of action. Tank-mix or alternate with a protectant fungicide. · For resistance management of late blight and for control of early blight, EVITO 480 SC Fungicide must be tank mixed with a protectant fungicide such as Manzate® ProStick Fungicide, Manzate® Disperss or Manzate® Max.

Do not apply more than 1.67 litres (800 g ai) of EVITO 480 SC Fungicide per hectare per year, or more than 800 g fluoxastrobin per ha per year of any fluoxastrobin-containing product, including any banded, in-furrow and seed treatment uses. • A maximum of 3 applications of EVITO 480 SC Fungicide is allowed per season if applied alone or 6 applications if applied in a tank mix with a fungicide of a different mode of action.

Fixed Copper - Use 4 kg in 1000 L of water per ha, spray to ensure thorough coverage of plants. Start applications when plants are 10-20 cm high and repeat at 7-10 day intervals. Do not apply more than 10 applications per year.

Forum™-Must be tank-mixed with one of the following fungicides: Polyram® DF, Dithane™ DG Rainshield™ or Bravo® 500. Apply at 0.45 L/ha in a tank mix with Polyram® DF or Dithane™ DG Rainshield™ or Bravo® 500, at the recommended product label rate. Make the first application when disease threatens or when first visible signs of disease occur within the field or nearby. Apply every 5-7 days under high disease pressure or every 7-10 days under low disease pressure. Under high level of late blight infection; apply after top-kill to reduce tuber blight. Where possible, rotate the use of Forum™ or other group 40 fungicides with different fungicide groups that control the same pathogens. Apply no more than 3 applications per season.

Gavel 75 DF-Apply at 1.7-2.25 kg/ha. The first application should be made at the first sign of disease or when late blight is reported in the area. Repeat applications every 7 days under high-disease pressure or when environmental conditions favor continued disease development. Where possible, rotate the use of Gavel® 75 DF or other group 22 and M fungicides with different fungicide groups that control the same pathogens. Apply no more than 6 applications per season.

Headline® EC-Apply at 0.45-0.67 L/ha. Begin applications prior to row closure, or when conditions become favorable for disease development. For early blight, apply on a 7-14 day interval. For late blight, apply on a 5-7 day interval. Use higher rates of Headline® EC alone and/or tank-mix with either Bravo® 500 or Polyram® DF under heavy disease pressure. Refer to the respective tank-mix partner label for rates, additional recommendations, restrictions and precautions. To reduce the potential of late blight resistance, no more than 1 application of Headline® may be made before alternating to a fungicide with a different mode of action for at least one application. Apply no more than 6 applications per season.

Kocide® 2000-Apply at 0.8-1.6 kg/ha. Begin applications when plants are 15 cm high. Repeat applications at 7-10 days interval until harvest. This product may be applied with a product containing Mancozeb (80% a.i.) at 1.75-2.25 kg/ha for the control of early blight and late blight. Kocide® 2000 at 2.4 kg/ha may be applied at vine kill with a desiccant or alone after vine kill prior to harvest. This late treatment may reduce late blight infection of tubers during harvest. Where possible, rotate the use of Kocide® 2000 or other group M fungicides with different fungicide groups that control the same pathogens.

Luna Tranquility®-Apply at 0.6 L/ha for brown leaf spot and early blight. Apply at 0.8 L/ha for black dot and white mold. Begin fungicide applications preventatively and continue as needed on a 7-14 day interval. When disease pressure is severe, use the shorter intervals. To limit the potential for development of disease resistance to these fungicide classes do not make more than 2 sequential applications of Luna Tranquility® or any Group 7 or Group 9 containing fungicide before rotating with a fungicide from a different Group. Do not apply more than 3.2 L/ha per season.

Manzate® DF/Pro-Stick™-Apply at 1.1-2.24 kg/ha. Begin applications when plants are 10-15 cm high; repeat at 7-10 day intervals. Start with low rate and increase to maximum as foliage develops. During periods of wet weather favoring late blight and/or vigorous crop growth, spray intervals may be reduced to 5-6 days. Where possible, rotate the use of Manzate® or other group M fungicides with different fungicide groups that control the same pathogens.

Manzate® MAX™-Apply at 1.72-3.5 L/ha. Begin applications when plants are 15 cm high; repeat at 7-10 day intervals. Start with low rate and increase to maximum as foliage develops. During periods of wet weather favoring late blight and/or vigorous crop growth, spray

intervals may be reduced to 5-6 days. Where possible, rotate the use of Manzate® or other group M fungicides with different fungicide groups that control the same pathogens.

Miravis - To control early blight and brown spot apply on a 7-14 day interval, starting prior to disease establishment. If disease pressure is high, use the shortest interval. For suppression of white mould, begin applications at 20% bloom. Repeat applications 10 - 14 days later. For suppression of Botrytis grey mould apply on a 7-14 day interval, starting prior to disease establishment. If disease pressure is high, use the shortest interval. Apply as a broadcast spray in sufficient water for thorough coverage. A minimum of 150 L/ha and 50 L/ha is recommended for ground and aerial application, respectively.

MPOWER Spade - Applications should begin prior to row closure or when conditions become favourable for the development of disease (whichever comes first). For early blight use 0.45 to 0.67 L/ha and apply on a 7-14 day interval. For late blight use 0.45 to 0.67 L/ha and apply on a 5-7 day interval.

Orondis™ Ultra-This fungicide is supplied as a co-pack with two different products in the case. Apply Orondis A at 0.4-0.6 L/ha, apply Orondis B at 0.12-0.35 L/ha. The mixing order is A then B. Begin applications prior to disease development and continue throughout the season on a 14-day interval. Do not use Orondis B for more than 33% of the total fungicide applications made for late blight. Rotate the use of Orondis™ Ultra or other group U15 and 40 fungicides with different fungicide groups that control the same pathogens. Apply no more than 4 applications per season.

Parasol Flowable-Begin applications when plants are 15 cm high. Repeat applications at 7-10 days interval until harvest. Use at 0.8-1.8 L/ha, depending on density of foliage, combined with 1.75-2.25 kg/ha of Mancozeb (80% a.i.). Parasol Flowable at 2.4 L/ha may be applied at top kill with a desiccant or after top kill prior to harvest. This late treatment may reduce late blight infection of tubers during harvest. Where possible, rotate the use of Parasol Flowable or other group M fungicides with different fungicide groups that control the same pathogens. Apply no more than 10 applications per season. Do not apply by air

Parasol WG-Begin applications when plants are 15 cm high. Repeat applications at 7-10 days interval until harvest. Use at 1.1-2.5 kg/ha, depending on density of foliage, combined with 1.75-2.25 kg/ha of Mancozeb (80% a.i.). Parasol WG at 3.4 kg/ha may be applied at vine kill with a desiccant or alone after top kill prior to harvest. This late treatment may reduce late blight infection of tubers during harvest. Where possible, rotate the use of Parasol WG or other group M fungicides with different fungicide groups that control the same pathogens. Apply no more than 10 applications per season. Do not apply by air

Parasol WP-Begin applications when plants are 15 cm high. Repeat applications at 7-10 days interval until harvest. Use at 1.1-2.5 kg/ha, depending on density of foliage, combined with 1.75-2.25 kg/ha of Mancozeb (80% a.i.). Parasol WP at 3.4 kg/ha may be applied at vine kill with a desiccant or alone after top kill prior to harvest. This late treatment may reduce late blight infection of tubers during harvest. Where possible, rotate the use of Parasol WP or other group M fungicides with different fungicide groups that control the same pathogens. Apply no more than 10 applications per season. Do not apply by air

Penncozeb® 75 DF Raincoat™-Begin applications early by applying 1.1 kg/ha when plants are 10-15 cm high. Increase to 1.75 kg/ha as plants increase in size, and to 2.25 kg/ha at row closure. Apply every 7-10 days throughout the season. During periods of wet weather favoring late blight and/or vigorous crop growth, spray intervals may be reduced to 5-6 days. Apply 1.1 kg/ha until row closure then increase the rate to 1.75 kg/ha until conditions allow the return to the regular spray schedule. Where possible, rotate the use of Penncozeb® 75 DF Raincoat™ or other group M fungicides with different fungicide groups that control the same pathogens.

Phostrol™-For preventative control of late blight, apply 2.9-11.6 L/ha on a 7-14 day interval. For preventative suppression of pink rot, apply 5.8-11.6 L/ha on a 7-14 day interval. Begin applications when conditions become favorable for disease development. Use the higher rate and shorter intervals when disease pressure is moderate to high. Where possible, rotate the use of Phostrol™ or other group 33 fungicide with different fungicides groups that control the same pathogens. Apply no more than 7 applications per season.

Polyram® DF-Begin application when plants are 15 cm high and continue at 7-10 days intervals using 1.1-1.75 kg/ha until row closure. Increase the rate to 2.25 kg/ha until tops are killed. Alternatively, begin application when plants are 15 cm high and continue at 5-7 days intervals using 1.1-1.75 kg/ha until top-killing. When conditions favor infections, use the shorter intervals in each case. Where possible, rotate the use of Polyram® DF or other group M fungicides with different fungicide groups that control the same pathogens.

Presidio™-Apply at 0.220-0.292 L/ha. For resistance management, Presidio™ must be tank-mixed with a label rate of another fungicide with a different mode of action that is registered for the same target pathogen. Apply Presidio™ in a tank mix with Bravo® 500. Follow the most restrictive use directions of either label. Make foliar applications on a 7-10 day schedule beginning when conditions are favorable, but prior to disease development. Apply no more than 2 sequential applications of Presidio™ before alternating with an effective fungicide from a different group. Apply no more than 4 applications per season.

Propulse - Do not apply more than 2 applications of PROPULSE per hectare per year. To limit the potential for development of disease resistance to this fungicide, do not make more than 2 sequential applications of PROPULSE or any Group 7 or Group 3 containing fungicide before rotating with a fungicide from a different Group.

Quadris® F-Apply at 0.5-0.8 L/ha on a 7-14 day interval starting prior to disease establishment. Where possible, rotate the use of Quadris® F or other group 11 fungicides with different fungicide groups that control the same pathogens. Apply no more than 2.4 L/ha per season. Do not exceed 3 applications per season.

Quadris® Top™—For early blight, apply at 0.566-1.0 L/ha on a 7-14 day interval, starting prior to disease establishment. For the suppression of white mold, apply at 1.0 L/ha. Begin applications at full bloom and repeat applications on a 7-10 day interval. If disease pressure is high, use the highest rate and shortest interval. Where possible, rotate the use of Quadris® Top™ or other group 3 and 11 fungicides with different fungicide groups that control the same pathogens. Do not exceed 3 applications per season. For disease suppression of brown spot and black dot, apply at 0.566-1.0 L/ha prior to disease development. Apply no more than 1 application to target these diseases.

Quash®-Apply at 0.175-0.280 kg/ha. Begin applications prior to infection for preventative control. If conditions are favorable for disease development, make additional applications at 7-10 day interval. Do not make more than 3 applications at the high rate or 4 applications at the low rate. Do not make more than 2 sequential applications before rotating to fungicides with a different mode of action. Do not apply more than 0.840 kg/ha per season.

Rampart®-For suppression of late blight and pink rot apply at 3-8 L/ha on a 7 day interval. Begin applications when conditions become favorable for disease development. Use the higher rate when disease pressure is moderate to high. Where possible, rotate the use of Rampart® or other group 33 fungicide with different fungicides groups that control the same pathogens. Do not apply at less than 3 day intervals. Apply no more than 5 applications per season.

Ranman 400 SC-Should be tank-mixed with an organo-silicone surfactant at 0.15 L/ha. Use the low rate (0.1 L/ha) for preventative applications or at very low disease pressure, increasing the rate up to the maximum of 0.2 L/ha as disease pressure and/or fast crop development increases. Apply by air with a minimum water volume of 50L/ha. For late blight tuber rot control, ensure that the last 2-3 applications prior to desiccation are made at the maximum rate 0.2 L/ha following resistance management practices. After 1 application, alternate with fungicides having a different mode of action. Apply no more than 6 applications per season.

Reason® 500 SC-Apply Reason® 500 SC at 0.2 L/ha tank-mixed with Bravo® 500 at 1.2-2.4 L/ha or 1.25 kg/ha of Dithane™ DG (or 935 g a.i./ha equivalent mancozeb). Begin applications when plants are 15-20 cm high or when disease threatens. Use the shorter spray interval when conditions favor disease development. Apply a fungicide of a different mode of action within 7-10 days after each application. Apply no more than 6 applications per season.

Revus®-Apply at 0.4-0.6 L/ha. Applications should begin prior to disease development and continue throughout the season on a 7-10 day schedule, following the resistance management guidelines. The use of a non-ionic adjuvant is recommended. Revus® may be tank-mixed with Bravo® 500, following the most restrictive use directions of either label. Where possible, rotate the use of Revus® or other group 40 fungicides with different fungicide groups that control the same pathogens. Apply no more than 4 applications per season.

Ridomil® Gold/Bravo® Twin Pak-Apply at 2.2 L/ha. Begin preventative applications early in the season when conditions are favorable for disease (before infection) and before row closure. Apply a second and third application at 14-day intervals. The label rate of a registered contact fungicide should be applied 7 days after each application. Do not tank-mix with a top-killer. Apply no more than 3 applications per season.

Ridomil® Gold MZ 68 WP-Apply at 2.5 kg/ha. The first application should be made before row closure. Apply a second and third application at 10-14 day intervals. Apply a contact fungicide, recommended for the control of late blight, 5-7 days after each application. When potato vines start to visually mature, discontinue use and return to a contact fungicide program. Do not tank-mix with a top-killer. Apply no more than 3 applications per season.

Scala® SC-Apply at 0.75 L/ha. Begin applications when plants are 15-20 cm high or when conditions are conducive to disease development. Repeat applications at 7-14 day intervals or as necessary to maintain disease control. If severe disease conditions exist, apply at 7-day interval. Scala® SC must be tank-mixed with Bravo® 500, following label directions of Bravo® ZN. Where possible, rotate the use of Scala® SC or other group 9 and M fungicides with different fungicide groups that control the same pathogens. Apply no more than 6 applications per season.

Sercadis®-Apply at 0.167-0.333 L/ha for the control of early blight. For optimal disease control, begin applications prior to disease development and continue on a 7 to 14 day interval if conditions are conducive for disease development. Use the higher rate and shorter interval when disease pressure is high. Apply at 0.333 L/ha at the beginning of flowering to control white mold. Apply a second time 7-14 days later up to full bloom if disease persists or weather conditions are favourable for disease development. The use of a non-ionic surfactant (0.125 % v/v) is recommended. Where possible, rotate the use of Sercadis™ or other group 7 fungicides with different fungicide groups that control the same pathogens. Apply no more than 3 applications per season.

Serenade® Opti™-Apply at 1.1-2.2 kg/ha. Begin applications soon after emergence and when conditions are conducive to disease development. Repeat as necessary on a 7-10 day interval. Where possible, alternate with fungicides that control the same pathogens. Ensure to maintain agitation during mixing and application to assure uniform product suspension.

Tanos™ - Apply at 0.56-0.84 kg/ha. Under low to moderate disease pressure use the lower rates. Under moderate to high disease pressure use the high rate. Initial applications should start when local conditions indicate that Late Blight is imminent. A minimum 12 day application interval must pass between the 1st and 2nd application of Tanos. A minimum 24 day application interval must pass between the 2nd and 3rd application of Tanos. Alternate with fungicides having a different mode of action. Apply no more than 3 applications per season. Apply by air with a minimum water volume of 50 L/ha.

Timorex Gold - Do not apply Timorex Gold with captan or sulphur, which could cause phytotoxicity. Carefully clean the spray tank, if you have used these products recently. When tank-mixes are permitted, read and observe all label directions, including rates and

restrictions for each product used in the tank-mix. Follow the more stringent label precautionary measures for mixing, loading and applying stated on both product labels.

Vertisan™-For botrytis vine rot apply at 1.25-1.5 L/ha and for early blight apply at 1.0-1.75 L/ha. Begin applications prior to disease development and continue on a 7-14 day interval. Use higher rate and shorter interval when disease pressure is high. Do not exceed 2 sequential applications before rotating to fungicides with different modes of action. Apply no more than 5 L/ha per season.

Zampro®-Apply at 0.8-1.0 L/ha. Begin applications prior to disease development and continue on a 5-10 day interval. Use the higher rate and shorter interval when disease pressure is high. The addition of a spreading/penetrating adjuvant is recommended to improve disease control performance. When used in accordance to the label recommendations, Zampro™ reduces tuber blight when applied at the higher rate immediately prior to or after vine kill. Do not apply more than 2 consecutive applications before rotating to another mode of action for at least one spray. Do not exceed 3 applications per season.

IN-FURROW POTATO FUNGICIDES 2022

COMMERCIAL NAME	ACTIVE INGREDIENT(S)	GROUP 1	DISEASES							RATE	DAYS TO HARVEST	HAZARD RATINGS	
			EARLY BLIGHT	FUSARIUM DRY ROT	LEAK	PINK ROT	RHIZOCTONIA CANKER	SILVER SCURF	VERTICILLIUM WILT			HUMANS	FISH
			<i>Alternaria solani</i>	<i>Fusarium</i> spp.	<i>Pythium</i> spp.	<i>Phytophthora erythroseptica</i>	<i>Rhizoctonia solani</i>	<i>Helminthosporium solani</i>	<i>Verticillium dahliae</i>				
Aprovia	Benzovindiflupyr	7	-	-	-	-	X	X	X	0.5-0.75 L/ha	n/a	LH	VHT
Azoshy 250 SC	Azoxystrobin	11	-	-	-	‡	‡	X	-	4-6 ml/ 100 m row	n/a	VLT	VHT
Double Nickel LC/55	<i>Bacillus amyloliquefaciens</i>	44	-	-	-	-	X	-	-	1-5 L/ha 0.2-1 kg/ha	0	VLT	VLT
Elatus	Azoxystrobin Benzofindiflupyr	11, 7	-	-	-	-	X	X	X	4-6ml/ 100 m row	n/a	VLT	VHT
Orondis Gold	Metalaxyl-M oxathiapripolin	4, 49	-	-	X	X	-	-	-	0.35L/Ha (A) 0.44L/Ha (B)	n/a		
Phostrol	Phosphorous acid	33	-	-	-	X	‡	-	-	53.1-106.1 ml/ 100 m row	0	VLT	MT
Presidio	Fluopicolide	43	-	-	-	X	-	-	-	0.292 L/ha	30	LT	VHT
Quadris F	Azoxystrobin	11	-	-	-	-	X	X	-	4-6 ml/ 100 m row	n/a	VLT	VHT
Sercadis	Fluxapyroxad	7	-	-	-	-	X	-	-	0.333 L/ha	7	VLT	VHT
Serenade SOIL	<i>Bacillus subtilis</i>	44	-	X	X	X	X	-	-	4.7-9.35 L/ha	0	VLT	VLT
Velum Prime	Fluopyram	7	X	-	-	-	-	-	-	4.5 ml/ 100 m row	0	LT	VLT
Vertisan	Penthiopyrad	7	-	-	-	-	X	-	-	15.5-31 ml/ 100 m row	7	VLT	VHT

- Product not registered for use against the particular disease.

X = Product registered for use against particular disease.

‡ = Product registered for use against particular disease when tank-mixed with Ridomil® Gold 480.

n/a = Not available

¹ Classification according to fungicide mode of action.

Aprovia - Maximum Residue Limits for Aprovia™ have not been established outside of NAFTA as of February 2017. Prior to applications, growers are advised to check with their potato buyers regarding Aprovia™ use. For the suppression of verticillium wilt, apply at the rate of 0.75 L/ha. Apply as an in-furrow spray in 50-150 L/ha of water 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. Do not apply more than 100 g a.i./ha of foliar benzovindiflupyr containing products on potato crops per season if an in-furrow application was made.

Azoshy 250 SC-Apply once as an in furrow spray in 50-140 L/ha of water 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.

Apply Azoshy 250 SC at the rate of 4 ml/100 m row mixed with Ridomil® Gold 480 EC/SL at the rate of 4 ml/100 m row, as an in furrow spray in 50-140 L water/ha. Mount the spray nozzle so the spray is directed into the furrow as a 15-20 cm band just before the seed is covered. Apply no more than 1 application per season.

Elatus – Make an in-furrow application in a water volume of 50-150 L/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. Apply the spray in a narrow band over the seed piece.

Double Nickel LC/55™-Apply directly over seed as an in-furrow spray in the appropriate amount of water per hectare. Mount the spray nozzle so the spray is directed into the furrow as a 10-15 cm band just before the seed is covered.

Phostrol™-Apply in a band at planting directly over the seed, using a minimum of 0.275 L water/ 100 m row. Phostrol™ may be tank-mixed with Ridomil® Gold 480 SL

Presidio®-Apply directly over seed as an in-furrow spray in the appropriate amount of water per hectare. Mount the spray nozzle so the spray is directed into the furrow as a 15-20 cm band just before the seed is covered. A second application should be made between hilling and tuber initiation, sprayed directly to the soil or as a broadcast spray. Do not combine in-furrow/soil application and foliar applications. Apply no more than 2 applications per season.

Orindis Gold Potato - Apply once as an in-furrow spray in 40 L per hectare of water at planting. Mount spray nozzle so the spray is directed into the furrow as a 15-20 cm band just before the seed is covered. Do not follow soil applications of ORONDIS GOLD A 200SC Fungicide with foliar applications of Orondis Fungicides, any other oxathiapiprolin-containing fungicides, or any other FRAC 49- containing product.

Quadris® F-Apply once as an in furrow spray in 0.46-1.28 L water/ 100 m row 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. Apply Quadris® F at the rate of 4 ml/100 m row mixed with Ridomil® Gold 480 EC/SL at the rate of 4 ml/100 m row, as an in furrow spray in 50-140 L water/ha. Mount the spray nozzle so the spray is directed into the furrow as a 15-20 cm band just before the seed is covered. Apply no more than 1 application per season.

Sercadis™-Apply at planting using a minimum of 50 L/ha of water as an in furrow spray. Direct spray pattern to uniformly cover seed pieces and surrounding soil. The spray pattern should be a 10-20 cm band that is applied to the seed piece prior to being covered with soil.

Serenade SOIL®-Apply as an in-furrow spray in the appropriate amount of water per hectare for the crop at planting. Mount the spray nozzle so the spray is directed in the furrow just before the seeds are covered.

Ridomil Gold 480SL - Apply once as an in-furrow spray in 50 to 140 L per hectare of water at planting. Mount spray nozzle so the spray is directed into the furrow as a 15-20 cm band just before the seed is covered.

Velum Prime™-Apply as an in furrow spray in 50-150 L/ha of water at planting. Mount the spray nozzles so the spray is directed into the furrow as a 10-15 cm band just before the seed is covered. When Velum Prime is applied as a soil application, alternate to a fungicide with a different mode of action for the first foliar application. **Please note that Velum Prime is also effective against nematodes and Black Dot disease.**

Vertisan™-Apply in furrow at planting, using 1.4-1.75 L water/ 100 m row. Do not exceed 1.75 L/ha per season.

POTATO SEED PIECE TREATMENTS 2023

COMMERCIAL NAME	ACTIVE INGREDIENT(S)	GROUP 1	FORMULATION	DISEASES					Product/ 100KG OF SEED	HAZARD RATING MAMMALS
				FUSARIUM DRY ROT <i>Fusarium spp.</i>	RHIZOCTONIA CANKER <i>Rhizoctonia solani</i>	SEED-BORNE LATE BLIGHT <i>Phytophthora infestans</i>	SILVER SCURF <i>Helminthosporium solani</i>	VERTICILLIUM WILT <i>Verticillium spp.</i>		
Cruiser Maxx® Potato Extreme	Thiamethoxam Fludioxonil 6.25% Difenoconazole 12.3%	4, 12, 3	SU	X	X	-	X	-	0.02 L	VLT
Emesto Silver	Penflufen 10% Prothioconazole 1.8%	3, 7	SC	X	X	-	X	-	0.02 L	VLT
Heads Up®	63.02% Saponins of <i>Chenopodium quinoa</i>	n/a	SP	-	X	-	-	-	0.001 kg	VLT
MancoPlus	Mancozeb 16%	M	DU	X	-	-	-	-	0.5 kg	VLT
Maxim® D	Fludioxonil 19.4 % Difenoconazole 19.4%	12, 3	SC	X	X	-	X	-	0.065- 0.130	VLT
Maxim® MZ PSP	Fludioxonil 0.5% Mancozeb 5.7%	12, M	DU	X	X	-	X	-	0.5 kg	VLT
Maxim® PSP	Fludioxonil 0.5%	12	DU	X	X	-	X	-	0.5 kg	VLT
Potato ST	Mancozeb 16%	M	DU	X	-	-	-	-	0.5 kg	VLT
Reason® 500 SC	Fenamidone 50%	11	SC	-	-	X	-	-	0.01 L	VLT
Senator 50 SC	Thiophanate-methyl 500g/L	1	DU	X	X	-	X	X	0.5 kg	LT
Vibrance Ultra Potato	Sedaxane Difenoconazole Mandipropamid	3,7,40	SU	X	X	X	X	-	32 ml	VLT

- Product not registered for use against the particular disease.

X = Product registered for use against particular disease.

¹ Classification according to fungicide mode of action.

n/a = Not available

Cruiser Maxx® Potato Extreme—Premixed product containing Cruiser insecticide Thiamethoxam as well as Fludioxonil and Difenoconazole for disease control.

Emesto Silver—May be tank-mixed with Titan™ insecticide

Heads Up®—Registered for organic use.

Reason® 500 SC—Apply when seed-born late blight is a threat. For optimal disease control, good coverage of the seed piece is required. Apply no more than 0.150 L of slurry/ 100 kg of seed pieces. May be tank-mixed with Titan™ and Emesto Silver.

Vibrance Ultra Potato - DO NOT apply more than 600 g of mandipropamid / ha / year. Refer to the REVUS® Fungicide label table for details on the maximum number of foliar applications that can be made after using VIBRANCE ULTRA POTATOES Fungicide to treat potato seed pieces.

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.

POST HARVEST FUNGICIDES 2023

COMMERCIAL NAME	ACTIVE INGREDIENT	GROUP 1	DISEASES							
			FUSARIUM DRY ROT <i>Fusarium spp.</i>	PHOMA <i>Phoma spp.</i>	PINK ROT <i>Phytophthora erythroseptica</i>	RHIZOCTONIA CANKER <i>Rhizoctonia solani</i>	SILVER SCURF <i>Helminthosporium solani</i>	SKIN SPOT <i>Oospora pustulans</i>	BACTERIAL SOFT ROT <i>Erwinia carotovora</i>	TUBER LATE BLIGHT <i>Phytophthora infestans</i>
Bio-Save® 10 LP	<i>Pseudomonas syringae</i> Strain ESC-10	n/a	X	-	-	-	-	-	-	-
Confine™ EXTRA	Phosphorous acid	33	-	-	X	-	X	-	-	X
Mertect® SC	Thiabendazole	1	X	X	-	X	X	X	-	-
Phostrol™	Phosphorous acid	33	-	-	X	-	X	-	-	X
Rampart®	Phosphorous acid	33	-	-	X	-	-	-	-	X
Serenade SOIL®	<i>Bacillus subtilis</i>	44	-	-	-	-	X	-	-	-
Stadium™	Azoxystrobin Difenoconazole Fludioxonil	11, 3, 12	X	-	-	-	X	-	-	-
StorOx	Hydrogen peroxide	M	X	-	-	-	X	-	X	-

- Product **not registered** for use against the particular disease.

X = Product **registered** for use against particular disease.

¹ Classification according to fungicide mode of action.

n/a = Not available

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

Bio-Save® 10 LP-Add 500 g of product to a minimal amount of water (approximately 100 L). Apply over conveyor belt or rollers by drip or spray to potatoes prior to storage. Apply the entire suspension to 136 500 kg of potatoes.

Confine™ EXTRA-Dilute CONFINE™ EXTRA Fungicide at a 1: 5.13 ratio with water. Apply 2 L of this solution as a spray to 1000 kg of potatoes prior to storage. Ensure complete and even coverage. A 1:5.13 ratio is equivalent to 326 ml product mixed with 1674 ml water to treat 1000 kg potatoes. Confine™ EXTRA is not recommended for use on potatoes intended for seed, as sufficient data does not exist to support this use.

Mertect® SC-Add 7.5 L of Mertect® SC to 170 L of water. Apply this suspension at the rate of 2 L 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 pathogens.

CAUTION: Do not combine Mertect® SC with chlorinated compounds. Do not use after sprout initiation. Some resistant strains of fusarium dry rot and silver scurf pathogens are now present in the region, reinforcing the need to use recommended rates and application methods

Phostrol™-Apply as a single spray directly to the tubers and ensure complete and even coverage. Add 0.42 L Phostrol™ in 2 L water. Apply this solution to 1000 kg of harvested potato tubers prior to storage.

Rampart®-Apply 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® as soon as possible after harvest. Application prior to storage of potato tubers: Dilute 0.19 L of Rampart® in 1 L of water. Apply 2 L of this solution as a spray or rinse to 1000 kg of harvested potato tubers prior to storage.

Application to stored potatoes: Dilute 0.19 L of Rampart® in 1 L of water. Inject 2 L of this solution per 1000 kg of stored potato tubers into water used for post-harvest storage.

Serenade SOIL-Apply as a spray on the bin piler at the rate of 5-10 L of Serenade SOIL per 100 L of water. Use 2 L of the suspension per 1000 kg of potatoes. Potatoes must rotate to ensure complete coverage. If needed, adjust rate of spray solution to ensure thorough coverage while maintaining recommended rate of Serenade SOIL per 1000 kg of potatoes.

Stadium™-Apply 32.5 ml in 2 L of water per 1000 kg of potatoes. Tubers should be rotating along a conveyor line in a single layer to ensure proper coverage. Do not make more than one post-harvest application to the tubers. To be used on table and processing potatoes only. Do not apply on seed potatoes. Users may notice a decrease in efficacy when Fusarium resistance to Fludioxonil is prevalent in a field. Maximum Residue Limits (MRLs) in potato products for export to a number of countries outside of North America have been established for the active ingredients in Stadium; however, they are not harmonized with North American levels. Prior to applications, growers are advised to check with their potato buyers regarding Stadium use.

StorOx-Apply on the bin piler as a spray for newly-harvested potatoes before storage at the rate of 100 ml of StorOx per 10 L of water. Spray diluted solution on tubers until runoff to achieve full and even coverage. Use 4.15-8.30 L of water per 1000 kg of potatoes. Thoroughly rinse out spray tank with water before mixing concentrate. StorOx should then be applied periodically throughout the storage period of the potatoes through direct injection into humidification water at the rate of 100 ml of StorOx per 10 L water. Apply the diluted product for at least 20 minutes per day, based on the humidification airflow rate of 0.6 cfm. Biosafe strips should be placed periodically around the tubers to determine if a longer application period is needed. If a growth inhibitor in liquid or mist formulation is to be applied, after the inhibitor has been applied discontinue StorOx applications for the remainder of the storage period. If no growth inhibitor is to be applied, continue StorOx applications for the remainder of the storage period. Applications to post-harvested potatoes works best when diluted with water containing low levels of organic or inorganic materials and with water having a neutral pH. StorOx readily mixes with clean, neutral water, does not require agitation and should not be combined with any pesticides or fertilizers.

WARNING: Do not combine Mertect SC with chlorine compounds. Do not use after the start of germination. Some resistant strains of fusarium rot and silver scab pathogens are now present in the area, reinforcing the requirement to use the recommended rates and application methods.

POTATO INSECTICIDES 2023

Product	Active Ingredient	Group	Form	Product /HA	GREEN PEACH APHID	POTATO APHID	BUCKTHORN APHID	COLORADO POTATO BEETLE	FLEA BEETLE	WIREWORM	EUROPEAN CORN BORER	TARNISHED PLANT BUG	LEAFHOPPER
ACETA 70WP	acetamiprid	4A	WP	56-86 g	*	*	*	*					
ACTARA 240SC	thiamethoxam	4A	FLOW	3.4 - 4.4 ml /100m furrow 7.8-24.4 ml/100Kg Seed	*	*	*	*					*
ADMIRE 240F	imidacloprid	4	FLOW	.85 - 1.3 L	*	*	*	*	*				*
AGRI-MEK	abamectin	6	SC	120 - 225 ml				*					
ALIAS 240EC	imidacloprid	4	FLOW	.85 - 1.3 L	*	*	*	*	*				*
AMBUSH	permethrin	3A	EC	0.19-0.28 L				*	*				
ASSAIL 70WP	acetamiprid	4A	WP	56-86 g	*	*	*	*					
BELEAF 50SG	flonicamid	29	SG	120 - 160 g	*	*	*						
CIMEGRA	broflanilide	30	SC	2.3ml/ 100m row						*			
CITADEL 480 EC	chlorpyrifos	1B	EC	1.0 L				*	*			*	
CLOSER™	sulfoxaflor	4C	SC	50 - 300 ml	*	*	*					*	*
CLUTCH foliar	clothianidin	4A	WG	70 - 105 g	*	*	*	*					*
CLUTCH in furrow	clothianidin	4A	WG	2.38-4.0 g /100 m				*					
CONCEPT	imidacloprid deltamethrin	4A, 3A	SU	650 ml	*	*	*	*	*		*	*	*
CORAGEN	chlorantaniliprole	28	SU	250 - 375 ml				*			*		
CORMORAN	acetamiprid novaluron	4A, 15	EC	440-750 ml	*	*	*	*			*		*
CRUISER Maxx Potato Extreme	thiamethoxam	4	SC	20 ml /Kg Seed	*	*	*	*					*
CYGNON 480E	dimethoate	1B	EC	0.55 - 1.0 L	*	*	*						*

Product	Active Ingredient	Group	Form	Product /HA	GREEN PEACH APHID	POTATO APHID	BUCKTHORN APHID	COLORADO POTATO BEETLE	FLEA BEETLE	WIREWORM	EUROPEAN CORN BORER	TARNISHED PLANT BUG	LEAFHOPPER
DECIS 100 EC	deltamethrin	3A	EC	50-75 ml	*	*	*	*	*				
DELEGATE™	spinetoram	5	WG	160 - 240 g				*			*		
DIBROM	naled	1B	EC	1.05 L				*	*				*
ENTRUST™	spinosad	5	SC	167-334 ml				*			*		
EXIREL	cyantraniliprole	28	SU	500-1500 ml	*	*	*	*	*		*		
FORTENZA	cyantraniliprole	28	SU	10-22.5ml/ 100kg seed				*					
FULFILL	pymetrozine	9C	50 W	0.193 Kg	*	*	*						
HARVANTA 50 SL	cyclaniliprole	28	SU	.8-1.2 L				*					
IMIDAN 50WP	phosmet	1B	WP	2.25 kg		*		*	*				*
LABAMBA	lambda-cyhalothrin	3A	EC	83 ml					*			*	*
LAGON 480	dimethoate	1B	EC	0.55 - 1.1 L	*	*	*					*	*
LORSBAN™ 4E	chlorpyrifos	1B	EC	1.0 L				*	*			*	
LORSBAN™ 50W	chlorpyrifos	1B	WP	.96 kg					*			*	
MALATHION 500E	malathion	1B	EC	1.5 - 2.25 L	*	*	*	*					*

Product	Active Ingredient	Group	Form	Product /HA	GREEN PEACH APHID	POTATO APHID	BUCKTHORN APHID	COLORADO POTATO BEETLE	FLEA BEETLE	WIREWORM	EUROPEAN CORN BORER	TARNISHED PLANT BUG	LEAFHOPPER
MALATHION 85E	malathion	1B	EC	1.0 L	*	*	*	*					*
MATADOR 120EC	lambda-cyhalothrin	3A	EC	0.083-0.125 L				*	*			*	*
MINECTO DUO 40WG	thiamethoxam cyantraniliprole	4, 28	WG	440 - 700 g	*	*	*	*	*				*
MINECTO PRO	abamectin cyantraniliprole	6, 28	SC	370-670 ml				*	*		*		
MOVENTO 240 SC	spirotetramat	23	SU	220 - 365 ml	*	*	*						
MPOWER KRYPTON	chlorpyrifos	1B	EC	1.0 L				*	*			*	
NIPSIT	clothianidin	4	SU	20.8 ml /100Kg Seed	*	*	*	*	*	*			*
NUFOS 4E	chlorpyrifos	1B	EC	1.0 L				*	*			*	
ORTHENE	acephate	1B	SP	560 - 825 g	*	*			*			*	*
PERM-UP	permethrin	3A	EC	180 - 260 ml				*	*		*	*	*
POLECI 2.5EC	deltamethrin	3A	EC	200-500 ml		*	*	*	*		*	*	*
POUNCE	permethrin	3A	EC	0.19-0.28 L				*	*			*	*
PYRIFOS 15G	chlorpyrifos	1B	GR	11.2 kg						*			
PYRINEX 480EC	chlorpyrifos	1B	EC	1.0 L				*	*			*	
RIMON 10EC	novaluron	15	EC	410 - 820 ml				*			*		
RIPCORD 400EC	cypermethrin	3A	EC	62.5 - 125 ml				*	*			*	*
SEFINA	afidopyropen	9	EC	.2 L	*	*							
SEVIN XLR	carbaryl	1A	SU	1.25-6.4 L				*	*		*	*	*

Product	Active Ingredient	Group	Form	Product /HA	GREEN PEACH APHID	POTATO APHID	BUCKTHORN APHID	COLORADO POTATO BEETLE	FLEA BEETLE	WIREWORM	EUROPEAN CORN BORER	TARNISHED PLANT BUG	LEAFHOPPER
SHARPHOS	chlorpyrifos	1B	EC	1.0 L				*	*			*	
SHARPHOS	chlorpyrifos	1B	EC	2.4 L in furrow						*			
SHIP 250 EC	cypermethrin	3A	EC	140-200 ml				*	*			*	*
SILENCER 120EC	lambda-cyhalothrin	3A	EC	0.083-0.125 L				*	*		*	*	*
SIVANTO PRIME	flupyradifurone	4	SC	500 - 1000 ml	*	*	*	*					
SUCCESS™	spinosad	5	SC	83 - 167 ml				*			*		
THIMET 20G	phorate	1B	GR	14 - 21 kg	*	*	*	*	*	*			*
TITAN	clothianidin	4	SU	20.8 ml /100Kg Seed	*	*	*	*	*	*			*
UP-CYDE 2.5 EC	cypermethrin	3A	EC	140-200 ml				*	*			*	*
VAYEGO 200 sc	tetraniliprole	28	SU	150 ml	*	*	*	*	*		*		
VERIMARK	cyantraniliprole	28	SU	750 - 1000 ml				*	*				
VYDATE™	oxamyl	1B	EC	2.3 - 3.0 L	*	*	*	*	*			*	*
WARHAWK 480 EC	chlorpyrifos	1B	EC	1.0 L				*	*			*	

INSECTICIDES NOTES

Many of the insecticides used on potatoes are highly poisonous to humans, animals, fish, and beneficial insects. Poisoning 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 Pest Control Products Act of Canada. Contamination of fisheries waters by pesticides is also against the law under the Fisheries Act of Canada.

Many of the products listed in this guide are toxic to bees, other important pollinators and beneficial species. To further minimize exposure to pollinators and beneficial species, refer to the complete guidance “Protecting Pollinators during Pesticide Spraying – Best Management Practices” on the Health Canada website (www.healthcanada.gc.ca/pollinators).

ABAMECTIN interferes with neuro-transmission in insects and mites resulting in paralysis, cessation of feeding and eventually death of the pest. Abamectin has contact toxicity, but its stomach toxicity activity is better than the contact toxicity. After 2-3 days of spraying abamectin, its insecticidal efficacy will be best and the longevity of residues will last about 7-15 days. Although it has no ovicidal action, it can permeate the internal leaves and kill the leaf larvae that

hide in the internal leaves and also prevent the newborn larvae from sneaking into the leaves. Besides, it can reduce appetite and egg amount of female adult that contact with the liquid on the blade.

ACEPHATE provides both contact and systemic control of foliar feeding insects for up to 2 to 3 weeks. Toxic to bees exposed to direct treatment, drift or residues on flowering crops or weeds. Do not apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize the spray drift to reduce harmful effects on bees in habitats close to the application site. Toxic to birds and wild mammals. Applications may adversely affect birds and wildlife visiting the treatment area. The use of this product may result in contamination of groundwater particularly in areas where soils are permeable (e.g., sandy soil) and/or the depth to the water table is shallow.

ACETAMIPRID is toxic to honey bees exposed to direct treatment. Do not apply when bees are present in the area to be treated. Acetamiprid exhibits a systemic translaminar action. It has novel mechanism action in the insect's nervous system by acting as an agonist to nAChR.

AFIDOPYROPEN is a dispersible concentrate (DC), selective contact insecticide for control of a variety of aphids. Afidopyropen is a member of the pyropene class of chemistry, Group 9, and causes immediate cessation of feeding. Laboratory studies have shown sublethal effects to bees. Studies conducted with this product have shown no effects on honeybee colony development. However, short term effects may occur. Minimize spray drift to reduce exposure to bees in habitats close to the application site.

BROFANILIDE is applied at planting as a dilute spray in water. Apply the in-furrow spray to uniformly cover the seed pieces and surrounding soil. The spray pattern should be a 10 to 20 cm (4 to 8 inch) band that is applied to the open seed piece furrow prior to being covered with soil. Dilute product in a minimum of 50 L of water per hectare and apply the dilute mixture into the furrow. Use sufficient water to ensure thorough coverage of the seed piece and surrounding seed furrow.

CARBARYL is toxic to bees. Bees may be exposed through direct spray, spray drift, and residues on leaves, pollen and nectar in flowering crops and weeds. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Avoid applications when bees are foraging in the treatment area in ground cover containing blooming weeds. Colorado Potato Beetle resistance to Carbaryl is known to occur.

CHLORANTANILIPROLE is a second-generation anthranilic diamide insecticide which acts on insect ryanodine receptors causing mortality from the uncontrolled release of the calcium ion stores in the muscle cells. Toxic to aquatic organisms. Observe buffer zones. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application site such as hedgerows and woodland. Toxic to bees. Bees may be exposed through direct spray, spray drift, and residues on leaves, pollen and nectar in flowering crops and weeds. Avoid applications when bees are foraging in the treatment area in ground cover containing blooming weeds.

CHLORPYRIFOS is toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application site such as hedgerows and woodland.

CLOTHIANIDIN is effective against the Colorado Potato Beetle, the Flea Beetle and aphids. It has low toxicity to humans and animals but is highly toxic to bees. It has a suppressive effect on wireworms.

CYANTRANILIPROLE is a member of bisamides class of insecticides. It is a ryanodine receptor (RyR) modulator which kills insects through unregulated activation of RyR. Insects exposed to cyantraniliprole become lethargic, paralyzed, and eventually die. Cyantraniliprole is a systemic insecticide which is active through both ingestion and contact routes; however, it is more potent via ingestion.

CYCLANILIPROLE is a second-generation anthranilic diamide insecticide which acts on insect ryanodine receptors causing mortality from the uncontrolled release of the calcium ion stores in the muscle cells. Toxic to aquatic organisms. Observe buffer zones. Toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application site such as hedgerows and woodland. Toxic to bees. Bees may be exposed through direct spray, spray drift, and residues on leaves, pollen and nectar in flowering crops and weeds. Avoid applications when bees are foraging in the treatment area in ground cover containing blooming weeds.

CYPERMETHRIN is effective against beetles by contact and stomach action. It behaves as a fast-acting neurotoxin. Exposure to sunlight, water and oxygen will accelerate its decomposition. Cypermethrin is highly toxic to fish, bees and aquatic insects.

DELTAMETHRIN is effective against beetles as a contact and stomach poison and may be effective against the common potato aphid and the buckthorn aphid at higher rates.

DIMETHOATE has low toxicity to humans. It is effective against potato and buckthorn aphids by contact and systemic action. It is an acetylcholinesterase inhibitor which disables cholinesterase, an enzyme essential for central nervous system function. It acts both by contact and through ingestion. It is readily absorbed and distributed throughout plant tissues and is degraded relatively rapidly.

FLUCONAMID is toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application site such as hedgerows and woodland. It is toxic to non-target terrestrial plants. Observe buffer zones specified under DIRECTIONS FOR USE. To reduce runoff from treated areas into aquatic habitats avoid application to areas with a moderate to steep slope, compacted soil, or clay. Avoid application when heavy rain is forecast. Contamination of aquatic areas as a result of runoff may be reduced by including a vegetative strip between the treated area and the edge of the water body.

FLUPYRADIFURONE is the first member of butenolide class of insecticides. Its mode of action is similar to neonicotinoid insecticides that act on the central nervous system of target insect pests as an agonist of the nicotinic acetylcholine receptor (nAChR). However, its chemical structure differs from the nitroguanidine neonicotinoids and thus it is a separate sub-class of IRAC Group 4.

IMIDACLOPRID is effective against the Colorado Potato Beetle, the Flea Beetle and aphids. It has low toxicity to humans and animals but is highly toxic to bees. It is a systemic insecticide that translocates rapidly through plant tissues following application. Imidacloprid acts on several types of post-synaptic nicotinic acetylcholine receptors in the nervous system.

LAMBDA-CYHALOTHRIN is effective against the following insects by contact and stomach action: Colorado Potato Beetle, Potato Flea Beetle, Potato Leafhopper, Tarnished Plant Bug, Tuber Flea Beetle and European Corn Borer.

MALATHION has low toxicity to humans and animals but is highly toxic to bees. It is registered for use against aphids and the Colorado Potato Beetle.

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

NOVALURON is an insect growth regulator that must be absorbed by eggs or ingested by insect larvae to be fully effective. The primary mode of action is by disrupting cuticle formation and deposition occurring when insects change from one developmental phase to another, resulting in death at molting. Novaluron does not have any effect on adult stages of insects.

OXAMYL is toxic to bees. Do not apply this product while bees are actively visiting the treatment area. Time applications to coincide with periods of minimum bee activity. It is effective against beetles and aphids through contact and systemic action.

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

PHORATE is highly toxic to humans. Phorate is to be used only in fields know to have wireworm problems.

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

PYMETROZINE is effective for the control of aphids on potato plants. Thorough spray coverage of plant foliage is essential for optimum control. The maximum number of applications is two per season. Pymetrozine exhibits excellent translaminar movement (movement across the leaf surface and into plant tissue) and is rainfast as soon as the spray solution has dried. Pymetrozine works primarily by ingestion, but also has some contact activity. Affected aphids stop

feeding shortly after exposure, but may remain on the plant foliage until they die, which is usually within 2-4 days. It has residual activity in the plant and will control aphids that move onto the plant after spraying.

SPINETORAM may be toxic to certain beneficial insects such as parasitoids and predatory mites and slightly harmful to foliage-dwelling predators. Care should be taken when using this product in an integrated pest management program where users are relying on the presence of beneficial arthropods. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application site such as hedgerows and woodland. Toxic to bees exposed to direct treatment, drift, or residues on flowering crops or weeds. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.

SPINOSAD is harmful to parasitoids and predatory mites and slightly harmful to foliage-dwelling predators. Care should be taken when using this product in an integrated pest management program where users are relying on the presence of beneficial arthropods.

SPIROTETRAMAT is a two-way systemic foliar insecticide that provides excellent, long-term control of immature and adult female stages of aphids. Spirotetramat is a Group 23 chemical that acts as a Lipid Biosynthesis Inhibitor (LBI). As an LBI, this product works by inhibiting the insect's ability to produce lipids, resulting in symptoms of poisoning and subsequent death following exposure. 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. Its residual activity continues to protect new plant growth. Contamination of aquatic areas as a result of runoff may be reduced by including a vegetative strip between the treated area and the edge of the water body. This product is toxic to bees through direct contamination of pollen and nectar. Do not apply this product during crop flowering period or when flowering weeds are present in the field. This product is toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application site, such as hedgerows and woodland. Spirotetramat can be toxic to non-target terrestrial plants. Observe buffer zones specified on the label.

SULFOXAFLOX is toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application site such as hedgerows and woodland. Toxic to bees exposed to direct treatment, drift, or residues on flowering crops or weeds. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Apply early in the morning or late in the evening when bees are not active. Consult the crop use directions for instructions related to timing of applications. The use of this chemical may result in contamination of groundwater particularly in areas where soils are permeable (e.g. sandy soil) and/or the depth to the water table is shallow. To reduce runoff from treated areas into aquatic habitats avoid application to areas with a moderate to steep slope, compacted soil, or clay. Avoid application when heavy rain is forecast. Contamination of aquatic areas as a result of runoff may be reduced by including a vegetative strip between the treated area and the edge of the water body.

TETRANILIPROLE is toxic to bees. The maximum number of foliar applications is 2 per season. Minimum interval between applications is 10 days. Minimum application volume is 100 L/ha. Maximum foliar applications per crop season 300 mL/ha (60 g ai/ha).

THIAMETHOXAM is toxic to certain beneficial insects. Minimize spray drift to reduce harmful effects on beneficial insects in habitats next to the application site such as hedgerows and woodland. This class of chemical is suitable for Integrated Pest Management (IPM) programs as it has a low toxicity to beneficial insects (including honeybees and bumblebees) and mites. However, do not apply directly to the bees that are actively foraging in the field. Do not apply when flowering weeds are present.

Weed Control in Potato

There are a number of reasons why potato growers should try to manage weeds within their fields. Weeds can compete with potato plants for light, water and nutrients. Weeds may act as hosts for other pests, such as diseases, insects or nematodes and could serve as a reservoir for pests within a field. Weeds can also interfere with potato harvest. Ultimately, weeds can decrease tuber yield and quality. A potato weed management program should follow the principles of Integrated Pest Management (IPM). IPM is a pest management strategy that integrates preventative, cultural, mechanical, biological and chemical control methods to achieve a sustainable production system that balances economic, health and environmental concerns. IPM is based on dynamic principles rather than on a definitive set of rules and can vary from farm-to-farm or even from field-to-field.

When planning a weed management program, producers must first be able to identify the weed issues present within a field before deciding on the best control method. By knowing the weeds present in your fields, you can gather information on their life cycle and biology, and have a better understanding of how certain weeds reproduce and survive and what is required to control them. The New Brunswick Department of Agriculture, Aquaculture and Fisheries maintains an integrated pest management image bank on the www.gnb.ca/agriculture website, available by clicking [here](#). This bilingual site contains images of diseases, insects, weeds and other disorders affecting New Brunswick's potato crop.

Once you have gathered the information through proper identification and scouting, you can make the decision as to whether or not a weed should be targeted for control. Knowledge of the specific weeds present in each potato field allows the selection of the best treatment for each field. Keep a record of the weeds and treatments you have used, and be prepared to change treatments if one or more weed species start to build up. If action is required, it is important to choose methods that optimize costs and effectiveness of control while minimizing any adverse effects. The most economical and effective potato weed management program combines cultural, mechanical and herbicide weed control practices.

Cultural Weed Control

Cultural weed control methods focus on management of the weeds within the crop rotation, preventing the entry of new weeds into a field and employing crop management decisions which may increase the competitive ability of the crop with weeds.

Weed control within the potato crop year begins with proper weed control in prior years. Potato growers should attempt to control weeds such as sow thistle and nightshades in other crops in the rotation because there are few control options for use on potatoes that are effective against these weeds. Growers should also consider herbicide choices within other crops, as residual herbicides can limit cropping choices in future years. Use of some potato herbicides in the current year, like metribuzin, can restrict planting choices in the future.

New weeds can be introduced to the field by equipment or crop choices. Quackgrass, marsh hedge-nettle or nutsedge can be spread from field to field on cultivation equipment. Machinery sanitation is important when moving from one field to another. Proper scouting and identification can help determine if new weed species are present. Ideally, escaped weeds should not be allowed to set seed.

Potato cultivars that develop and maintain a dense canopy can be competitive with weeds. Crop uniformity and density is determined by the variety and seed spacing. Plant misses as a result of poor quality seed, poor seed cutting, planting conditions or a malfunctioning planter will reduce crop density and competitiveness with weeds. It is important that the planter be operating efficiently to produce a uniform competitive plant stand. Early closure of the rows will shade out potential weed issues, although other disease and insect management strategies should also be considered.

Mechanical Weed Control

Mechanical weed control is an effective tool for controlling annual weeds. If performed under the wrong conditions, tillage can have a negative effect on the efficiency of harvesting operations, yield and quality. Hilling is the only post planting tillage operation necessary in the production of potatoes. The main objective of hilling is to provide sufficient soil for tuber set and development. A proper hill will also prevent greening, minimize infection with late blight, minimize frost damage and facilitate harvest.

Pre-plant tillage can be used to control early season weeds. A shallow cultivation of the field 2-3 days before potatoes emerge with a finger weeder, cultivators set to work shallow, or drag chains can provide control of small emerged annual broadleaf weeds and grasses. Some control of perennial weeds will be provided but these are more difficult to control. Addition of a between-the-row cultivation, after crop emergence, will give control of weeds present. Subsequent hilling operations will give further control of weeds. Set equipment properly to control weeds between the row and to bury weeds in the row with soil. Some control of established perennial weeds will be obtained but the equipment, if not properly cleaned, may also spread weeds to clean fields.

Herbicide Weed Control

A number of herbicides are recommended for use in potatoes. Excellent weed control can be achieved if the spray program is planned in advance and is based on knowledge of each production field. Herbicides must be used responsibly and judiciously. They are just one component of an integrated weed management plan. Potatoes emerge approximately 15 to 30 days after planting. A significant number of weeds can germinate in this time period. Cultivation and hilling will disturb the herbicide treated soil allowing weeds to germinate. If hilling is performed just prior to emergence of potatoes, then a pre-emergent herbicide may not be required. An application of a non-selective herbicide just prior to emergence of potatoes will control annual weeds and set back perennial weeds. Burn-off herbicides are not affected by tillage operations.

If you start with a pre-emergence (PRE) herbicide treatment, you can apply post-emergence (POST) herbicide treatments later if necessary. If you ignore the possibility of PRE treatments and rely only on a POST treatment you have no other options if that treatment fails to give satisfactory weed control. An integrated option for weed control is the use of herbicide bands over the potato rows with mechanical weed control between the hills. A fact sheet outlining this method of weed control is available at this location:

www.agrireseau.qc.ca/phytoprotection/documents/BandedPesticidePotatoes.pdf

Herbicide Notes

Do not use a herbicide more than once or apply an additional herbicide during the growing season unless split or combination treatments are registered. Supply companies sell products with different concentrations of the same herbicide. Over the years, some companies have changed the concentration of active ingredient in a product. Various concentrations of glyphosate, linuron, metribuzin, EPTC and other herbicides are available, so refer to the specific product label for each herbicide to verify correct application rates are used for these products. Always read and follow label directions for every pesticide application. Pesticides approved for use in Canada may not have similar approvals in all export markets. Always check with your processor or buyer to make sure products used are acceptable within their markets.

CLETHODIM (Select, Centurion, Arrow and others) is a systemic post-emergence herbicide with uptake primarily through the leaves. Clethodim should be used at all times in a tank-mix with the adjuvant Amigo or X-Act. Apply clethodim when the annual grasses are in the 2 to 6 leaf stage. Most effective control is achieved if the application is made prior to tillering when annual grasses are small and actively growing. Most effective quackgrass control results are achieved when application is made at the 3 to 5 leaf stage, when the canopy is uniform and actively growing. Clethodim will be less effective when plants are stressed by lack of moisture, excessive moisture, low temperature and/or very low relative humidity. Potatoes are tolerant to clethodim at all growth stages. Do not apply if rainfall is expected within 1 hour of application. Thorough coverage of the leaf foliage is necessary for consistent grass control. The time for complete control is normally 7 to 21 days after application depending on growing conditions and crop competition.

DIMETHENAMID-P (Frontier Max) will control annual grasses, red root pigweed and Eastern black nightshade, including Group 2 and triazine resistant biotypes. Dimethenamid-p should be applied as a pre-emergent application before weeds emerge and after potatoes have been planted. Do not apply before planting or onto emerged potatoes. The best time to apply is shortly after a hilling operation that was made just before potatoes emerge. In cold and wet growing conditions, dimethenamid-p application may result in delayed emergence or early season stunting of potatoes. The application rate will depend on soil type and organic matter levels. Apply higher rates on fine textured or high organic matter soils and for heavier weed problems. Apply in a minimum of 100 litres of water per hectare, to ensure good coverage. Select proper nozzle and pressure to avoid spraying fine mist. For best results, use flat fan or flood jet nozzle. Rainfall is required to activate and move the herbicide

into the soil zone. If dry conditions persist, a shallow cultivation or the use of a rotary hoe will move the chemical into moist soil and control weed escapes. If cultivation is necessary because of soil crusting or compaction, tillage should be shallow to minimize dilution of the herbicide. An eleven month interval is required before planting rotational crops that are not registered for use with dimethenamid-p.

EPTC (Eptam) is applied under low pressure (200 kPa) in 110-340 litres of water per hectare. EPTC can be used at the following times: 1) before planting, 2) at drag-off (a light cultivation before potatoes emerge) or 3) post emergence. Regardless of the timing of application, incorporation of the chemical is essential. Once trapped in the soil, a vapour forms when EPTC comes into contact with moisture. This vapour acts to destroy germinating weed seeds and quackgrass rhizomes (if rhizomes are 7.5 cm or less). A few broadleaf weeds, such as wild radish and wild mustard, are not controlled. Another herbicide application is usually required to control some weeds tolerant to EPTC. EPTC can also be tank mixed with metribuzin and applied before planting. Refer to the label for best application, tillage and weed control conditions for this herbicide.

FLUAZIFOP-P-BUTYL (Venture L) is applied post emergence to potatoes and weeds and will provide control of many annual grasses and quackgrass. It does not control broadleaf weeds or sedges. Growth of grasses stops soon after application but destruction of the whole plant may take several weeks. Fluazifop will be less effective when weeds are not growing rapidly due to stress from lack of moisture, excessive moisture, flooding, low-temperature and/or very low relative humidity. For annual grass control, apply when the annual grasses have 2-5 leaves. For quackgrass control, apply when the quackgrass has 3-5 leaves. Pre-plant tillage to fragment quackgrass rhizomes improves control. Do not cultivate until 5 days after application. Do not apply if rainfall is expected within 2 hours of application. Fluazifop may also be tank mixed with metribuzin formulations for early post emergent applications. Use a maximum volume of 300 L/ha.

FOMESAFEN (Reflex) is applied pre-emergence to potatoes for the control of red-root pigweed and ragweed, plus suppression of lambs quarters. Fomesafen should be used to compliment other herbicide applications and may help with weed resistance management. Apply at a rate of 1 L/ha after planting but before potato emergence. If weeds are emerged, include a recommended non-ionic surfactant at 0.1% v/v. Apply in a minimum of 200 L water per hectare. Do not cultivate the soil for 7 days following application. Do not apply to soils with more than 5% organic matter or to fine textured soils. Fomesafen may remain active in the soil for several months and residues present a potential for carry-over damage for certain crops. Do not apply fomesafen to any field more than once every two years. The pre-harvest interval is 70 days.

GLUFOSINATE AMMONIUM (Ignite): Apply glufosinate prior to ground crack (potato emergence). For best results, apply to emerged, actively growing weeds. Weeds emerging after application will not be controlled. Apply in 110-330 litres of water per hectare. Glufosinate works as a contact herbicide, so uniform, thorough coverage improves control. In addition, application of the spray at a 45° angle forward will result in better coverage. At cool temperatures (below 10°C), poor moisture and low humidity, speed of action may be reduced. Leave a 1 m buffer between edge of field and environmentally sensitive areas. Do not spray when winds exceed 16 km/hr if using open boom sprayers. For residual control of annual weeds, glufosinate may be tank mixed with Sencor 500 F. Do not apply if rainfall is expected within 4 hours of application. **Do not use this product as a vine desiccant before harvest.**

GLYPHOSATE (Roundup and others) is sold under many trade names and formulations, verify the correct application rates with specific product labels. Glyphosate is used for perennial weed control prior to planting potatoes. Glyphosate has no soil activity and therefore will not injure crops planted in the treated area. Glyphosate, when used after weed emergence but before ground crack will control emerged weeds. Emerged potato plants will be injured and reduced yield may result. Apply in the spring or fall for quackgrass control. Quackgrass must be at least 20 cm in height (3 to 4 leaf stage). Tillage prior to application will reduce control of quackgrass. Where tillage is desired, delay for 5 to 7 days after glyphosate application. Weed control with glyphosate is reduced if dirty or hard water is used for application. The addition of ammonium sulfate to the spray mix is recommended if glyphosate must be applied in hard water.

LINURON (Lorox L, Linuron) is applied pre-emergence as potato plants must be covered to avoid injury. Potato seed should be 5 cm below the treated soil. Use sufficient water (300 L per ha) to cover the ground evenly. Abnormally heavy rainfall following application may cause crop injury. Sufficient moisture (usually 3-5 cm) is necessary after treatment to carry the chemical into the root zone of germinating weeds; best results are obtained when this occurs within 7 to 10 days after application. Avoid cultivation after application if possible. 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 soils and the lower rate on sandy soils.

METRIBUZIN (Sencor, Tricor, Squadron, Metrix) application pre-emergence to potatoes is preferred. The higher rate is usually required to control annual grasses, to slow the growth of quackgrass and for dense weed infestations. Use the low rate for broadleaf weed control only. Moisture is needed shortly after a pre-emergence application for improved weed control. Apply in 100-300 L water/ha. Avoid overlapped applications that will increase dosages above those recommended.

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 10 cm high. This treatment may cause temporary yellowing and/or leaf burn, especially when the crop is under the stress of poor growing conditions. Do not use when plants are under stress, such as cool, wet, cloudy weather conditions or very dry soil conditions. Do not use on muck soil. Not all potato varieties have been tested for tolerance to metribuzin. Some potato varieties (such as early maturing, red-skinned, Atlantic, Eramosa, Shepody) can be sensitive to and injured by an application of metribuzin (such as yellowing/necrosis of leaf veins or leaf margins, stunting, and possible delay in harvest). First use of metribuzin on a potato variety must be limited to a small test area to ensure risk or level of potential injury is acceptable to the grower prior to adoption as a general field practice. Sensitivity to or injury after a postemergent application of metribuzin is typically visible in the test area within 5 days after application. Do not apply metribuzin early post-emergence on Shepody, Tobique, Belleisle, Sante, Tolaas, Atlantic, Eramosa, red-skinned varieties and potatoes grown for early market. Superior and Norchip appear to be sensitive to metribuzin applied post-emergence. Use only pre-emergence on Shepody cultivars. Consult your chemical dealer or seed supplier for information on the tolerance of newly released varieties. Under New Brunswick 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 applied early post-emergence to potatoes could be better than abandoning the crop to weeds, such as barnyard grass, weeds which are difficult to control by cultivation. If insufficient metribuzin was used pre-emergence, an additional early post-emergence treatment for annual grass may be applied. Do not apply more than a total of 1.1 kg active metribuzin per hectare in a growing season. Fall-seeded cover crops and certain vegetables such as cole crops, seeded the following spring, can be injured from metribuzin residue in the soil.

METRIBUZIN/S-METOLACHLOR (Boundary LQD) is a commercial pre-mix of two active ingredients. The rate of metribuzin in Boundary LQD is lower than the typical metribuzin rates used in potato production, so growers may need supplemental weed control when using this product. Boundary LQD is applied before potato emergence. For additional information, follow the restrictions and recommendations from metribuzin and s-metolachlor sections of the guide. Do not apply at ground crack or if potatoes are emerged.

METRIBUZIN/S-METOLACHLOR (Strim MTZ) is a commercial pre-mix of two active ingredients. The recommended rate of metribuzin in Strim MTZ is similar to the typical metribuzin rates used in potato production. Strim MTZ is applied before potato emergence. For additional information, follow the restrictions and recommendations from metribuzin and s-metolachlor sections of the guide. Do not apply at ground crack or if potatoes are emerged.

METRIBUZIN/SULFENTRAZONE (Sencor STZ) is a mixture of two active ingredients, to help control triazine resistant weeds and other hard to control species. Follow all restrictions from the Sencor label. Applications must be made before potato emergence to avoid crop injury. A minimum of 2.5 cm (1 inch) of soil must cover emerging potato shoots at application. Injury may occur if potato seed pieces are germinating or if they are located near the soil surface. Avoid soil disturbance, including hilling, after application. Sencor STZ requires rainfall to activate, ideally within 10-14 days following application. A range of application rates are listed on the label. Use higher rates for longer season potatoes, heavy weed infestations or in soils with a pH less than 7.0 and organic matter greater than 3%. Only apply to soils between 1.5-6 % organic matter and with a pH of less than 7.8. Sulfentrazone should only be applied to any field once in a two year period. Authority products contain sulfentrazone as an active ingredient.

PYROXASULFONE (Zidua) is a suspension concentrate herbicide for the control of labelled annual grasses and annual broadleaf weeds in potatoes. Pyroxasulfone may be applied for the early season residual suppression when an in-crop application of another registered herbicide is planned. Application rates are for all soil types. Use the higher rate in the listed rate range for longer residual and under heavier weed populations.

Moisture is necessary to activate the active ingredient pyroxasulfone in soil for weed control. Dry weather following applications may reduce effectiveness. However, when adequate moisture is received after dry conditions, pyroxasulfone will control susceptible germinating weeds. Apply in a minimum water volume of 100 L/ha. Apply pyroxasulfone as a broadcast spray to the soil surface after planting but before crop and weed emergence. There should be 5 cm (2 inches) of soil covering the seed piece and/or sprout/vegetation. Efficacy will be reduced if later cultural practices expose untreated soil. Apply pyroxasulfone only to a uniform seedbed which is firm and free of clods and cracks. The seedbed must be prepared to ensure good seed piece row closure and soil coverage of the seed pieces. Before applying to potato, verify with your local seed company (supplier) the selectivity of pyroxasulfone on your variety to avoid potential injury. The use of pyroxasulfone may result in temporary growth suppression in potato under stressful conditions, such as, inadequate or excessive moisture or rainfall, cool and hot temperatures, compacted or crusted soils, improper planting depth, injury from other pesticides, disease or other pest damage, mechanical injury, nutrient imbalances, or other conditions known to cause plant stress. Do not apply pyroxasulfone more than once per year in potato. Do not apply pyroxasulfone prior to planting potato seed pieces. Do not apply pyroxasulfone to emerging or emerged potato as severe crop injury will occur. Do not apply pyroxasulfone in soils classified as a sand.

RIMSULFURON (Prism™ SG, Rimsulfuron) is applied as a post-emergence treatment to control annual grasses in the 1 to 6 leaf stage, lambs quarters and red root pigweed in the 4 to 6 leaf stage and quackgrass in the 3 to 6 leaf stage, when potato plants are less than 10 cm tall. Apply before potatoes have initiated flowering. Do not apply within 30 days of harvest. Apply in a minimum of 100 L/ha of water and use within 24 hours of mixing as the herbicide will degrade in acidic or highly alkaline water. A non-ionic surfactant, either Citowett Plus, Agral 90 or Agsurf, is required within the spray mixture at 2 L surfactant per 1000L spray solution. Application of rimsulfuron may result in temporary foliar symptoms (discolouration of younger leaves and pinching of the terminal leaf). These symptoms may be confused with symptoms of a viral disease. Early application timing may reduce the likelihood of foliar symptoms. Under extreme weather conditions, such as hot, dry weather, excessive moisture, or frost, weed control may be reduced. Rainfall within 2-4 hours after application may reduce weed control. Crop injury may result if application is made to potatoes that have been stressed by abnormally hot, humid or cold weather conditions, frost, low fertility, drought, water saturated soil, compacted soil, previous pesticide applications, disease or insect damage. If potatoes have been injured by frost, wait 48-72 hours before application.

SETHOXYDIM (Poast Ultra) is a post-emergence, contact and systemic herbicide for control of certain grasses; uptake is primarily through leaves. This herbicide does not control broadleaf weeds. Thorough coverage of the foliage is necessary for consistent grass control. Apply to actively growing grasses. Complete annual grass control takes 7 to 21 days depending on growing conditions and crop competition while quackgrass control may take 6 to 8 weeks. Application is made at the 1 to 6 leaf stage of annual grasses and at the 1 to 3 leaf stage of quackgrass. Cultivation no sooner than 7 days after application of sethoxydim will improve grass control. Best results are obtained in water volumes of 100 to 200 litres per hectare. Do not use flood jet or hollow cone nozzles with this herbicide as the level of grass control will be reduced. Surfactants are required to be used with sethoxydim. See product label for information on rate of application and mixes with surfactants Merge and Assist. Do not apply if rainfall is expected within one hour of application. Do not apply within 80 days of harvest.

S-METOLACHLOR (Dual II Magnum, Komodo) controls most annual grasses, yellow nutsedge and Eastern black nightshade. For control of yellow nutsedge apply preplant incorporated (ppi) as recommended on the product label. For annual grass control, use either ppi or pre-emergence applications. 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.

HERBICIDE SELECTION TABLE																				
Weed Control Rating E - Excellent F - Fair G - Good P - Poor + Weed controlled if emerged - Lack of information	Potato Tolerance	Annual Broadleaves										Grasses			Perennials					
		chickweed	hemnettle	lamb's quarters	mustard family	nightshades	pigweeds	ragweeds	smartweed family	wild buckwheat	wild radish	barnyard grass	foxtail	smooth crabgrass	Canada thistle	field mint	goldenrod	marsh hedge-nettle	quackgrass	sow thistle
BEFORE PLANTING																				
EPTC – High rate	E	F	-	F	P	F	E	G	F	P	P	E	G	G	P	-	-	-	G	P
glyphosate – Low rate	P	+	+	+	+	+	+	+	+	+	+	+	+	+	P	+	+	+	G	E
glyphosate – High rate	P	+	+	+	+	+	+	+	+	+	+	+	+	+	E	+	+	+	E	E
s-metolachlor	G	P	P	F	P	F	F	-	P	P	-	G	G	G	P	P	P	-	P	P
PRE EMERGENCE																				
dimethenamid-p	G	-	-	F	P	G	G	P	P	P	P	E	E	E	P	-	-	G	P	P
fomesafen	F	-	-	F	-	-	G	G	-	-	-	P	P	P	-	-	-	P	P	-
glufosinate ammonium	G	+	E	E	E	G	E	E	E	G	F	E	E	E	-	F	-	P	G	-
glyphosate	P	G	E	E	E	G	E	E	E	E	E	E	E	E	P	F	F	F	F	F
linuron	F	G	G	E	E	P	G	G	E	E	F	F	F	F	P	P	P	F	P	P
linuron + s-metolachlor	G	G	G	E	E	F	E	G	E	G	G	E	E	E	P	P	P	F	P	P
metribuzin	G	G	E	E	E	P	E	E	E	G	G	G	G	G	P	P	-	F	F	P
metribuzin + glufosinate	G	+	E	E	E	G	E	E	E	G	G	E	E	E	-	F	-	F	F	P
metribuzin + linuron	G	E	E	E	E	P	E	E	E	E	E	G	G	G	P	P	P	F	P	P
metribuzin + s-metolachlor	G	G	E	E	E	F	E	E	E	G	G	E	G	G	P	P	P	F	P	P
metribuzin + sulfentrazone	G	G	E	E	E	P	E	E	E	G	G	G	G	G	P	P	-	F	F	P
pyroxasulfone	G	-	-	F	-	F	F	-	-	-	-	G	G	G	-	-	-	-	-	-
SOON AFTER EMERGENCE (REFER TO NOTES SECTION)																				
metribuzin	F	G	E	E	E	P	E	E	E	G	E	G	G	F	-	-	-	F	F	P
POST EMERGENCE																				
clethodim – Low rate	E	P	P	P	P	P	P	P	P	P	P	E	E	E	P	P	P	P	F	P
clethodim – High rate	E	P	P	P	P	P	P	P	P	P	P	E	E	E	P	P	P	P	E	P
fluzifop-p-butyl – Low rate	E	P	P	P	P	P	P	P	P	P	P	E	E	G	P	P	P	P	F	P
fluzifop-p-butyl – High rate	E	P	P	P	P	P	P	P	P	P	P	E	E	G	P	P	P	P	E	P
rimsulfuron	G	G	-	F	G	F	G	P	F	F	E	E	E	E	P	-	E	G	G	P
sethoxydim – Low rate	E	P	P	P	P	P	P	P	P	P	P	E	E	E	P	P	P	P	P	P
sethoxydim – High rate	E	P	P	P	P	P	P	P	P	P	P	E	E	E	P	P	P	P	E	P

Note: For additional information, refer to Herbicide Notes, Herbicide Application Table and Product Labels. Control ratings in this chart are provided to facilitate choosing the best treatment and are not a guarantee of performance. Factors such as weather, stage of growth, herbicide rate, water volume etc. can influence ratings.

HERBICIDE APPLICATION TABLE										
For additional information, please refer to Herbicide Notes, Herbicide Selection Table and Product labels.				Formulation	Hazard	Restricted Entry Interval	Pre-Harvest Interval	Group	Buffer Zone	
									Terrestrial	Water <1m
Chemical Name	Product	Product/ha	Surfactant							
BEFORE PLANTING										
EPTC	Eptam	4.25 – 8.5 L/ha	None	EC	VLH	24	45	8	4	1
glyphosate ¹	Various: Round-up etc.	2.5 – 7 L/ha	Optional	SN	VLH	12	-	9	15	15
s-metolachlor	Dual II Magnum, Komodo	1.25 – 1.75 L/ha	None	EC	VLH	12	-	15	-	29
PRE EMERGENCE										
dimethenamid-p	Frontier Max	0.756 – 0.963 L/ha	None	EC	LH	24	40	15	3	1
fomesafen	Reflex	1 L/ha	Optional	SN	LH	12	70	14	15	15
glufosinate	Ignite	2.7 – 5 L/ha	None	SN	VLH	12	-	10	1	1
glyphosate ¹	Various: Round-up etc.	2.5 L/ha	Optional	SN	VLH	12	-	9	15	15
linuron	Lorox L	2.25-4.5 L/ha	None	SU	VLH	24	-	7	-	-
linuron + s-metolachlor	Lorox L Dual II Magnum, Komodo	1.9 – 2.3 L/ha 1.25 – 1.75 L/ha	None	SU EC	VLH	24	-	7 15	-	29
metribuzin	Sencor, Tricor, Squadron Sencor FL, Metrix, Tricor LQ	0.55 – 1.5 kg/ha or 0.85 – 2.25 L/ha	None	DF SU	VLH	12	60	5	10	5
metribuzin + glufosinate	Sencor FL, Metrix, Tricor LQ Ignite	1.1 L/ha 2.7 – 5 L/ha	None	SU SN	VLH	12	60	5 10	10	5
metribuzin + linuron	Sencor, Tricor, Squadron Lorox L	0.55 – 1.1 kg/ha 1.6 – 3.75 L/ha	None	DF SU	VLH	24	60	5 7	10	5
metribuzin + s-metolachlor	Sencor, Tricor, Squadron Dual II Magnum, Komodo	0.55 – 1.5 kg/ha 1.25 – 1.75 L/ha	None	DF EC	VLH	12	60	5 15	10	29
metribuzin/ metolachlor	^{S-} Boundary LQD	1.85 – 2.5 L/ha	None	EC	VLH	12	60	5 15	10	29
metribuzin/ metolachlor	^{S-} Strim STZ	2.9-3.9 L/ha	None	EC	VLH	12	60	5 15	10	29
metribuzin + sulfentrazone	Sencor STZ	0.6 – 0.8 kg/ha 0.16 – 0.22 L/ha	None	DF FL	VLH	12	60	5 14	10	5
pyroxasulfone	Zidua SC	0.12 – 0.24 L/ha	None	SC	VLH	12	-	15	1	5
SOON AFTER EMERGENCE (REFER TO NOTES SECTION)										
metribuzin	Sencor, Tricor, Squadron Sencor FL, Metrix, Tricor LQ	0.55 – 1.5 kg/ha 0.85 – 2.25 L/ha	None	DF SU	VLH	12	60	5	10	5
POST EMERGENCE										
clethodim	Select/Arrow	0.19 – 0.38 L/ha + 0.5 – 1.0 % v/v	Amigo or X-Act	EC	VLH	12	60	1	15	-
fluzifop-p-butyl	Venture L	1.0 – 2.0 L/ha	None	EC	VLH	12	45	1	15	15
rimsulfuron	Prism™ SG, Rimsulfuron	60 g/ha + 0.2 % v/v	Non-ionic	SG	LH	12	30	2	5	1
sethoxydim	Poast Ultra	0.32 – 1.1 L/ha + 1 – 2 L/ha surf	Merge or Assist	EC	VLH	12	80	1	2	1
Formulation: DF – Dry Flowable; EC – Emulsifiable Concentrate; SC – Suspension Concentrate; SN – Solution ; SU – Suspension; SG – Soluble Granule Hazard : LH – Low Hazard; VLH – Very Low Hazard Note: 1) Rates are presented for 356 g active/L formulations. Refer to specific product label to ensure correct application rates. Apply after weeds emerge, but before potatoes emerge, no residual activity.										

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 will also cause color loss in processing potatoes. Sprout removal is not necessary when sprout inhibitors have been used. Never use Maleic Hydrazide or CIPC in a seed storage. Never store Maleic Hydrazide or CIPC-treated potatoes in a seed storage. Never use Maleic Hydrazide or CIPC-treated potatoes for seed. When sprout inhibitors are used as directed, tuber residues are below tolerance levels and there are no harmful effects on humans.

Product Name	Chemical Name	Method of Application	Comments
Drexel Sprout Stop 60 SG Royal MH 60 sG Royal MH 30 Xtra	Maleic Hydrazide	Applied at 5.65 kg product (12.6 liters for Royal MH 30 Xtra) per hectare in a minimum of 300 L/ha water with ground equipment or a minimum of 100 L/ha with aerial equipment.	Time of application is critical. Follow label instructions carefully.
Restrain Fuel	Denatured Ethanol 90%	12.5 mg/m ³ 0.01 L/m ³ (10 ppm)	Apply continuously until potatoes are removed from storage. For seed potatoes, apply continuously until 5-days prior to planting
Aceto Sprout Nip Briquettes Ag-Services Potato Sprout Inhibitor Ag-Services 98A Potato Sprout Inhibitor Ag-Services 750A Potato Sprout Inhibitor Brenntag Sprout Nip 980 DECCO 271 Aerosol Pin Nip	Chlorpropham (CIPC) Fog Application	Applied in storage after curing and suberization are complete. Cannot be used in storage containing seed potatoes. Seed cannot be safely stored in a treated storage within 3 years of treatment. Depending upon storage conditions, a repeat application may be necessary to achieve desired results.	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.
1,4SIGHT	1,4-Dimethylnaphthelene aerosol application	First application made in storage any time after tubers are placed in storage but before sprouting.	In-storage application is available only from a manufacturer's representative.
1,4SEED		Re-treatment is only required if eye opening is visible. Allow one (1) month between treatments. Do not exceed 80 ppm during storage season. 1,4SEED may be used on seed tubers.	Rate of application depends upon variety, storage temperature, facility, venting and tuber condition. Do not allow vapors to contact seed storage areas within 60 days of planting.
1,4SHIP		Ready-to-use aerosol. Apply any time after tubers have been prepared for shipment and placed in shipping container, rail car, truck, or storage room. One (1) can treats 9,000-10,000 kg of tubers. Do not re-apply.	Do not use treated area for seed storage until 60 days after treatment. Do not allow vapors to contact seed storage areas within 60 days of planting
SmartBlock	3-decen-2-one	Apply through fogging equipment, 137.5 ml per tonne after dormancy has ended and tubers have 'peeping' sprouts.	Do not apply more than 550 ml per tonne per storage season
Aceto Shield EC Ag-Services EC DECCO 276 EC Sprout Nip EC Spud Guard 2 EC	Chlorpropham (CIPC) Emulsifiable Concentrate	An emulsifiable formulation of chlorpropham that is applied after storage. Mixed with water it is sprayed on potatoes during the grading operation. Apply a 1% active ingredient emulsion to clean, washed potatoes using 1.0 liter of solution 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 buds. Follow label instructions carefully in regards to application equipment, mixing directions and application rates.
The current United States tolerance for CIPC residue is 30 ppm for tubers and 40 ppm for wet peel.			
The current United States tolerance for Maleic Hydrazide residue is 50 ppm.			
Never use maleic hydrazide or CPIC in a seed warehouse. Never store potatoes treated with maleic hydrazide or CPIC in a seed warehouse. Never use potatoes treated with maleic hydrazide or CPIC as seed.			

DISINFECTION

Cleaning and disinfection of storages and potato handling equipment each year are essential elements of a potato disease management program to eliminate carryover of disease-causing bacteria. Warehouse and equipment disinfection programs are used primarily to control bacterial ring rot (BRR) of potatoes, but can also reduce the potential for soft rot, Silver Scurf, and Fusarium problems.

An effective disinfection program is a three-step process that includes:

1. Removal of all loose debris, dirt, and trash from equipment and the warehouse.
2. A thorough cleaning of all surfaces! Cleaning is best accomplished using water, a pressure washer, and a detergent. The detergent helps to prepare a surface for subsequent disinfection.
3. A registered disinfectant, applied after cleaning and in a manner that ensures the surface remains wet for a minimum of ten minutes.

Disinfection of seed cutters and planters between seed lots is important in reducing the potential for pathogen transfer between different seed lots. Sponge rollers on seed cutters should be removed, cleaned, and soaked in a container of disinfectant. Used equipment should be cleaned and disinfected before the equipment arrives on the farm. Borrowed equipment should be disinfected before arriving on the farm and prior to leaving the farm.

Transport trucks arriving on farms for loads of potatoes should be disinfected prior to arriving on the farm. After the truck has been loaded, the vehicle should be disinfected once more prior to leaving the farm. The possibility exists for such vehicles to carry potato debris from one location to another, increasing the risk of disease spread.

The choice of disinfectant (only one is currently registered) will depend on availability of a product, its efficacy, registration, the type of surface being disinfected, and specific safety considerations. Some disinfectants work well on metal and wood but can corrode rubber and plastics on conveyor belts or other machine parts. Quaternary ammonium compounds (registered for BRR control) are effective on porous surfaces like wood and only slightly corrosive to metal. Equipment that is being disinfected outside, on warm sunny days, must be given special attention to ensure the ten-minute exposure time is maintained.

DISINFECTANTS REGISTERED FOR THE CONTROL OF BACTERIAL RING ROT

CHEMICAL	PRODUCT	CONCENTRATION	HAZARD RATING	CAUTIONS
n-alkyl dimethyl benzyl ammonium chloride	AG-SERVICES INC. GENERAL STORAGE	6 mL/L water	VLT	avoid skin or eye contact and inhalation of mist

POISON INFORMATION

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

POISON INFORMATION CENTRES

EMERGENCY

New Brunswick - 911 Ask for poison information

NON-EMERGENCY

New Brunswick - (506) 857-5555 or (506) 648-6222

ENVIRONMENTAL EMERGENCIES

New Brunswick - 1-800-565-1633

THINK SAFETY FIRST

METRIC CONVERSION FACTORS FOR IMPERIAL SYSTEM			
	Metric Units	÷ Approximate conversion factor	= Results in:
LINEAR	Millimetre (mm)	÷25	Inch
	Centimetre (cm)	÷ 30	Foot
	Metre (m)	÷ 0.9	Yard
	Kilomtre (km)	÷ 1.6	Mile
AREA	Sq. Centimetre (cm ²)	÷ 6.5	Square Inch
	Sq. Metre (m ²)	÷ 0.09	Square Foot
	Hectare (ha)	÷ 0.4	Acre
VOLUME	Cubic Centimetre	÷ 16	Cubic Inch
	Cubic Decimetre	÷ 29	Cubic Foot
	Cubic Metre	÷ 0.8	Cubic Yard
	Millilitre	÷ 28	Fluid Ounce
	Litre	÷ 1.1	Quart
	Litre	÷ 4.5	Gallon
	Hectolitre	÷ 0.36	Bushel

WEIGHT	Gram	÷ 28	Ounce
	Kilogram	÷ 0.45	Pound
	Tonne	÷ 0.9	Ton
	Tonne	÷ 0.0454	Hundredweight
TEMPERATURE	Celsius	$(9/5 C^{\circ})+32$	Fahrenheit
PRESSURE	Kilopascal (kPa)	÷ 6.9	Pounds/Sq. Inch
POWER	Watt	÷ 746	Horsepower
	Kilowatt (kW) ÷0.75 horsepower	÷ 0.746	Horsepower
VELOCITY	Metres/second (m/s)	÷ 0.3	Feet/second
	Kilometres/hour (Km/h)	÷ 1.6	Miles/hour
AGRICULTURE	Hectolitres/hect. (hl/ha)	÷.90	Bushels per acre
	Litres per hect. (L/ha)	÷11.23	Gallons per acre
	Litres per hect. (L/ha)	÷2.8	Quarts per acre
	Litres per hect. (L/ha)	÷1.4	Pints per acre
	Millilitres/hect. (L/ha)	÷70	Fluid ounces per acre
	Tonnes per hect. (t/ha)	÷2.24	Tons per acre
	Kilograms per hect (kg/ha)	÷1.12	Pounds per acre
	Grams per hect. (g./ha)	÷70	Ounces per acre
	Plants per hect. (plants/ha)	÷2.47	Plants per acre

Section Editors			
INSECTICIDES	David Wattie	DAAF	david.wattie@gnb.ca
HERBICIDES & TOP-KILLERS	Tom Dixon	DAAF	tommy.dixon@gnb.ca
FUNGICIDES & SEED TREATMENTS	Khalil Al-Mughrabi	DAAF	khalil.al-mughrabi@gnb.ca
SPROUT INHIBITORS	Leigha Beckwith	DAAF	leigha.beckwith@gnb.ca
DISINFECTANTS & SAFETY	Suzanne Young	DAAF	suzanne.young@gnb.ca