

# GUIDE TO PEST MANAGEMENT IN FIELD LETTUCE

**Nova Scotia Vegetable Crop Guide to Pest Management 2011**  
[LET1-11]

Revised June 16, 2011 by  
**Peter Burgess, Horticulturist, AgraPoint International Inc.**  
**Sarah Wood, Ag Info Specialist, AgraPoint International Inc.**

## IMPORTANT

This publication was compiled by representatives from AgraPoint using information from the Pest Management Regulatory Agency of Health Canada, specific pesticide labels, previous Atlantic Provinces Vegetable Pest Guides and manufacturer's information. **This information is continuously changing and therefore it can cease to be current and accurate. Pesticide labels are the best source of information and should always be consulted prior to using a product.** The label is the best source of information on: registered crop uses, rates, days to harvest, compatibility with other pesticides, toxicity and other special information on its effective and safe use

By printing this publication, AgraPoint does not offer any warranty or guarantee, nor do they assume any liability for any crop loss, animal loss, health, safety or environmental hazard caused by the use of a pesticide mentioned in this publication.

## WARNINGS

**This publication is meant to be used as a reference for possible pest control options.** Where there are multiple brand names of a specific active ingredient registered in Canada, AgraPoint has only listed a couple for reference purposes and as such does not endorse one brand over another. If you have purchased a generic product not specifically in this guide but has your crop and pest on the label, always follow that product label.

**If any information in this or any other publication conflicts with the information on the label, always use the label recommendation.** If you have an old label, your pesticide supplier should be able to give you the newest label. You are legally responsible for the safe use of pesticides you purchase. This means the safe transport and storage of these materials, the label rates used on crops, and the safe disposal of containers.

Pest	Pesticide Common Name	Pesticide Product Name	Rate	Days to Harvest	Remarks
<b>WEEDS:</b>					
<b>Preplant</b>  <i>Perennial weeds including quackgrass</i>	glyphosate	<b>Roundup 356 Sn</b>	1.25-2.5 L/ha	7	Apply in the fall or spring prior to planting. Annual weed control programs will be necessary to control weeds germinating after planting. For quackgrass control, apply to actively growing quackgrass when at least 4 new leaves are present. The low rate (2.5 L/ha) will provide a minimum of one season control, while higher rates (4.75 to 7 L/ha) will provide longer term control. The low rate of Roundup should be applied in 50 to 100 L/ha water. If higher water volumes are used add a suitable surfactant. Wait 72 hours before plowing under. Best control of quackgrass is obtained when these herbicides are applied in the fall.
		<b>Roundup WeatherMAX</b>	1.67-8.0 L/ha	7	
		<b>Touchdown 480</b>	2.5-7.0 L/ha	7	
	carfentrazone-ethyl	<b>Aim EC</b>	36.5-117 mL/ha	1	Apply in minimum spray volume of 100 L/ha. Refer to label for target weeds, buffer zones and rates. Use high flow rate nozzles to apply the highest spray volume.
<b>Pre-emergence</b>  <i>Stale Seedbed Technique</i>	paraquat	<b>Gramoxone 200 Sn</b>	2.75-5.5 L/ha	-	Apply in 300 – 1100 L of water/ha to foliage of emerged weeds but before the crop has emerged.
	diquat	<b>Reglone 240</b>	2.3-4.6 L/ha	-	

<b>Pre-emergence</b> <i>Annual Grasses and some broadleaves</i>	propyzamide	<b>Kerb 50 WSP</b>	2.2 kg/ha	55	Use on mineral soils only. Do not replant a second crop of lettuce in the same season. One application per year. For transplanted lettuce apply Kerb 7-10 days post-transplant.
<b>Postemergence</b> <i>Inter-row shielded</i>	paraquat	<b>Gramoxone 200 Sn</b>	2.75-5.5 L/ha	-	Do not spray solution on the crop plant since it could be injured or killed. Use gramoxone for best control of grasses.
	diquat	<b>Reglone 240</b>	2.3-4.6 L/ha	-	
	carfentrazone-ethyl	<b>Aim EC</b>	36.5-117 mL/ha	1	Apply in minimum spray volume of 100 L/ha. Refer to label for target weeds, buffer zones and rates. Use high flow rate nozzles to apply the highest spray volume.
<b>Postemergence</b>	propyzamide	<b>Kerb 50 WSP</b>	2.2 kg/ha	55	Transplanted lettuce only. Apply Kerb 7-10 days after planting. One application per year.
	sethoxydim	<b>Poast Ultra plus Merge</b>	0.32-1.1 L/ha 0.5-2 L/ha	30	Transplanted lettuce – 1 application per year, between 1 to 6 leaf stage Direct seeded – 2 applications per year. 1 <sup>st</sup> between 1 to 6 leaf stage, 2 <sup>nd</sup> 14 to 21 days after thinning. DO Not exceed 1.1 L/ha per year.
<b>INSECTS:</b>					
<b>Aster Leafhopper</b>	cypermethrin	<b>Ripcord 400 EC</b>	125 ml/ha	14	7-14 day spray schedule. Up to 4 applications per season.
		<b>UP-Cyde</b>	200 ml/ha	14	
	carbaryl	<b>Sevin XLR Plus</b>	1.25-2.5 L/ha	5 (head lettuce) 21 (leaf lettuce)	Use low rate on young plants. Repeat applications at 7-10 day intervals as necessary. <b>Do not apply when foliage is wet or when rain or excessive humidity is expected during the next 2 days</b>

	malathion	<b>Malathion 500 EC</b>	1.5-2.75 L/ha	3 (head lettuce) 14 (leaf lettuce)	Weekly or twice weekly during growing season.
	kaolin	<b>Surround WP</b>	12.5-25 kg/ha	-	<b>This is an OMRI listed control product and is suitable for organic production.</b> Apply in 500 L of water. Apply at 7-14 day intervals once initial infestation is detected. Use high rate for early applications. Do not exceed 25 kg/ha per application.
<b>Aphids</b>	imidacloprid	<b>Admire 240 F</b>	10.2 ml/ 1000plants	21	<b>Transplant tray plug drench.</b> Do not follow with soil or foliar treatments
		<b>Admire 240 F</b>	650 ml/ha	21	<b>Soil application (field drench)</b> Apply after transplanting in 2000 L water/ha. Max 1 application per year; 24hr re-entry
		<b>Admire 240 F</b>	200 ml/ha	7	<b>Foliar</b> – Do not make foliar application after either a transplant or soil drench of Admire. 24hr re-entry
	acetamiprid	<b>Assail 70 WP</b>	0.056-0.086 kg/ha	7	Max 5 applications per year, alternate with other products; 12 hr re-entry
	pirimicarb	<b>Pirimor 50 DF</b>	0.3-0.5 kg/ha	7	Repeat as needed. Apply in 500-1000 L of water / ha.
	endosulfan	<b>Thiodan 4 EC</b>	2 L/ha	14	Head lettuce only, Max 3 applications/yr
		<b>Thionex 50 WP</b>	1.75 kg/ha	14	
	acephate	<b>Orthene 75 SP</b>	0.75-1.1 kg/ha	7	Head lettuce only, Max 4 applications/yr
	diazinon	<b>Diazinon 50 EC</b>	1.1 L/ha	10	
	dimethoate	<b>Lagon 480 EC</b>	700 ml/ha	7	Leaf lettuce only
	methamidophos	<b>Monitor 480</b>	1.1-2.25 L/ha	14	Head lettuce only; 48 Hr re-entry
	Pymetrozine	<b>FulFill 50WG</b>	193 g/ha	14	Apply when aphids first appear. Do not exceed 2 applications per season. Allow 7 days between applications. Causes feeding cessation shortly after application but aphids may remain on
	<i>Added June 16<sup>th</sup></i>				

					the plant for 2-4 days before they die. The use of a non-ionic surfactant at a rate of 0.25% v/v is recommended to improve performance under drought stress conditions.
	Flonicamid <i>Added June 16th</i>	<b>Beleaf 50SG</b>	0.12-0.16 kg/ha	0 days	Thorough spray coverage of plant foliage is essential. Minimum of 94 litres of water/ha. Maximum of 3 applications per season, allow 7 days between applications. <b>Avoid overnight storage of spray mixtures, do not use liquid fertilizer as a carrier and do not use adjuvants.</b>
<b>Aphids and Whiteflies</b>	spirotetramat	<b>Movento 240 SC</b>	220-365 ml/ha	3	Minimum interval between applications is 7 days. Maximum of 730 ml/ha of product applied per season. <b>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, orchard or vineyard.</b>
		<b>Movento 150 OD</b>	347-585 ml/ha	3	Minimum interval between applications is 7 days. Maximum of 1.17 L/ha of product applied per season. <b>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, orchard or vineyard.</b>
	spiromesifen	<b>Forbid 240 SC</b>	500-600 ml/ha	7	Maximum of 3 applications per season. Minimum application volume of 100 L/ha. 12 hour REI. See label for buffer zone restrictions. <b>Whitefly only (including silverleaf, sweetpotato and</b>

					<b>greenhouse)</b>
<b>Cabbage Looper</b>	<i>Bacillus thuringiensis</i>	<b>Dipel 2X DF</b>	275-550 g/ha	0	Apply when larvae are small and in the early instar stages. Not effective as larvae become larger.
		<b>Thuricide HPC</b>	2.0-4.25 L/ha	0	
	spinosad	<b>Success 480 SC</b>	182 ml/ha	1	Max 3 applications/yr. Allow 7-10 days between applications
		<b>Entrust 80 W</b>	109 g/ha	1	
	spinetoram	<b>Delegate WG</b>	140-200 g/ha	1	Time application with peak egg hatch or small larvae. Repeat applications based on population monitoring. Use higher rate for higher infestations or advanced growth stages. Maximum of 3 applications per year with a minimum re-treatment interval of 5 days.
	cyhalothrin-lambda	<b>Matador 120 EC</b>	83 ml/ha	3	Head lettuce only. Max 3 applications/yr; 24 hr re-entry.
	endosulfan	<b>Thiodan 4 EC</b>	2 L/ha	14	Head lettuce only, Max 3 applications/yr
		<b>Thionex 50 WP</b>	1.75 kg/ha	14	
	methomyl	<b>Lannate Toss-N-Go</b>	0.51-1.0 kg/ha	7	24hr re-entry
	acephate	<b>Orthene 75 SP</b>	0.75-1.1 kg/ha	7	Head lettuce only. Max 4 applications per season. Apply in 225-1650 L of water / ha.
	methamidophos	<b>Monitor 480</b>	1.1-2.25 L/ha	14	Head lettuce only; 48 Hr re-entry
	chlorantraniliprole	<b>Coragen</b>	250 ml/ha	1	Begin applications when treatment thresholds have been reached. Maximum of 4 applications per season. Do not apply more than once every 3 days. Do not exceed 1 L of Coragen per ha per season. Apply in a finished spray volume of 100L/ha.
<b>Cutworm</b>	cyhalothrin-lambda	<b>Matador 120 EC</b>	83 ml/ha	3	Head lettuce only. Max 3 applications/yr; 24 hr re-entry.
	cypermethrin	<b>Ripcord 400 EC</b>	175 ml/ha	21	Do not disturb soil for 5 days after treating
	permethrin	<b>Pounce</b>	180-390 ml/ha	-	Apply up to the 5-leaf stage. Do not disturb soil for 5 days after treating.

<b>Tarnished Plant Bug</b>	Lambda cyhalothrin	<b>Matador 120 EC</b>	83 ml/ha	3	<b>For Head and Leaf Lettuce.</b> Use 500 L/ha of spray volume for thorough coverage. Maximum of 3 applications per year, with a 7 day interval between treatments.
	endosulfan	<b>Thiodan 4 EC</b>	2 L/ha	14	
		<b>Thionex 50 WP</b>	1.75 kg/ha	14	
	carbaryl	<b>Sevin XLR Plus</b>	2.5-5.25 L/ha	5 (head lettuce) 21 (leaf lettuce)	
<b>DISEASES:</b>					
<b>Aster Yellows</b>	-	-	-	-	Control Aster leafhoppers
<b>Damping Off</b>	metalaxyl	<b>Ridomil 2G</b>	25 kg/ha	-	Apply with seed in furrow. Do not use on transplants
	thiram	<b>Thiram 75 WP</b>	90 g/25kg seed	-	One application as a seed treatment  Do not apply to leafy greens that are destined to be grown in the greenhouse.
	metalaxyl-M and s-isomer	<b>Apron XL LS</b>	20–40 ml / 100kg of seed	-	
<b>Botrytis (Grey mold)</b>	iprodione	<b>Rovral 50 WP</b>	1.5 kg/ha	4	Max 4 applications/yr. Start after thinning and apply at 7 day intervals.
	boscalid	<b>Lance WDG</b>	0.285 kg/ha	14	Max 2 applications/yr; 4 hr re-entry
	ferbam	<b>Ferbam 76 WDG</b>	2 kg/ha	-	Spray seedlings before transplant. Apply in 1000L / ha
	<i>Bacillus subtilis</i>	<b>Serenade MAX</b>	1.0-3.0 Kg/ha	0	<b>Serenade Max, Serenade ASO and Rhapsody ASO are biopesticides that will only suppress the indicated diseases.</b> For suppression, begin applications soon after emergence or transplant and continue as necessary on a 7 to 10 day interval. When environmental conditions are conducive to rapid disease development, use in a
		<b>Serenade ASO</b>	4.0-12.0 L/ha	0	
		<b>Rhapsody ASO</b>	1.0-2.0 L/100 L of water	0	

					rotational program with other registered fungicides. Thorough coverage is essential.
	<i>Trichoderma harzianum</i> Rifai strain KRL-AG2	<b>RootShield HC</b>	10 g / L of water	1	This biopesticide is for suppression of botrytis blight ( <i>B. cinerea</i> ), apply 10 grams per liter of water to foliage every 7-14 days depending upon disease pressure. Apply sufficient spray volume to adequately cover the leaves. <b>This product does not work well when soils are below 10 degrees C.</b>
<b>Downy Mildew</b>	Metalaxyl-M/mancozeb	<b>Ridomil Gold MZ 68 WP</b>	2.5 kg/ha	14	For head lettuce only. Apply every 14 days beginning at thinning. Max 3 applications/yr.
	zineb	<b>Zineb 80 WP</b>	1.7-2.3 kg/ha	10	At first sign of disease, spray at 7-10 day intervals.
	fosetyl-al	<b>Aliette WDG</b>	2.8 kg/ha	7	Max 5 applications/yr; 12 hr re-entry
	<i>Bacillus subtilis</i>	<b>Serenade MAX</b>	3.0-6.0 Kg/ha	0	<b>Serenade Max, Serenade ASO and Rhapsody ASO are biopesticides that will only suppress the indicated diseases.</b> Begin applications at the first sign of disease, or when conditions become conducive for disease development. Repeat as necessary on a 7-10 day interval.
		<b>Serenade ASO</b>	7.0-15.0 L/ha	0	
		<b>Rhapsody ASO</b>	1.0-2.0 L/100 L of water	0	
	mandipropamid	<b>Revus plus Non-ionic adjuvant</b>	400-600 ml/ha plus 0.125% v/v	1	<b>For control of Downy Mildew and Blue Mold.</b> Applications should begin prior to disease development and continue throughout the season on a 7-10 day schedule of fungicides, following the resistance management guidelines. Maximum four applications per year.
fluopicolide	<b>Presidio</b>	220-292 ml/ha	2	<b>Apply in 200-1000 l/ha.</b> For resistance management, Presidio Fungicide must be tank-mixed with a labelled rate of another fungicide registered for the target pathogen, but	

					<p>with a different mode of action. Apply Presidio Fungicide in a tank mix with Aliette. Follow the most restrictive use directions of either label.</p> <p>Make foliar applications on a 7 to 10 day schedule beginning with initial flowering, or when disease conditions are favourable, but prior to disease development. Use the lower rate and longer interval as preventive applications. Use the higher rate and shorter interval if disease is present.</p>
<b>Sclerotinia (Head and Leaf Drop)</b>	dicloran	<b>Botran 75 WP</b>	2.3-3.75 kg/ha	14	Max 2 applications/yr. Apply a directed spray to the lower portion of the plant and soil surface after thinning. Make a second application as a foliar at the rosette stage.
	boscalid	<b>Lance WDG</b>	0.385 kg/ha	14	Max 2 applications/yr; 4 hr re-entry
	vinclozolin	<b>Ronilan EG</b>	1.1 kg/ha	28	Apply 1-2 days after thinning for direct seeded or 5-7 days after transplanting. Apply at ten day intervals. Max 3 applications/yr; 12 hr re-entry
	<i>Bacillus subtilis</i>	<b>Serenade MAX</b>	1.0-3.0 Kg/ha	0	<b>Serenade Max is a biopesticide that will only suppress the indicated diseases.</b> Make the 1 <sup>st</sup> application at planting (or immediately following planting but prior to crop emergence). Make a 2 <sup>nd</sup> application as a directed spray with multiple nozzles per seed line in sufficient water to ensure thorough coverage of lower plant leaves and surrounding soil surface within 7 days of thinning. Repeat applications on 10-14 day intervals if conditions for disease development persist.

		<b>Serenade ASO</b>	5.0-15.0 L/ha	0	<b>Serenade ASO and Rhapsody ASO are biopesticides that will only suppress the indicated diseases. Head and leaf drop:</b> Apply as a directed spray with multiple nozzles to each seed line in sufficient water to ensure thorough coverage of lower plant leaves and surrounding soil surface within 7 days of thinning or transplanting. Repeat applications on 10-14 day intervals if conditions for disease development persist. Use higher rate and lower application intervals under conditions of moderate to high disease pressure.
		<b>Rhapsody ASO</b>	1.0-2.0 L/100 L of water	0	
<b>Powdery Mildew</b>	<i>Bacillus subtilis</i>	<b>Serenade MAX</b>	3.0-6.0 Kg/ha	0	<b>Serenade Max, Serenade ASO and Rhapsody ASO are biopesticides that will only suppress the indicated diseases.</b> Begin applications at the first sign of disease, or when conditions become conducive for disease development. Repeat as necessary on a 7-10 day interval.
		<b>Serenade ASO</b>	4.0-12.0 L/ha	0	
		<b>Rhapsody ASO</b>	1.0-2.0 L/100 L of water	0	
	quinoxyfen <b>Added July 8<sup>th</sup>, 2010</b>	<b>Quintec</b>	240 ml/ha	1	Maximum of 4 applications per year. Repeat applications on 10-14 day intervals. 12 hr worker re-entry interval. <b>Apply before visual symptoms of Powdery Mildew appear. Quintec has no curative properties and will not control established infections. * Note</b> <b>* – product is toxic to bees exposed to direct treatment, drift, or residues on crops or weeds.</b>

**Use the following web link to search for any pesticide label mentioned in this guide, or any other pesticide registered in Canada:**

**[http://pr-rp.pmra-arla.gc.ca/portal/page?\\_pageid=34,17551&\\_dad=portal&\\_schema=PORTAL](http://pr-rp.pmra-arla.gc.ca/portal/page?_pageid=34,17551&_dad=portal&_schema=PORTAL)**

# PESTICIDE EMERGENCY CONTACT INFORMATION

<b>Poison Control Centres</b>		
Nova Scotia	800.565.8161 or 902.428.8161	IWK, Halifax, NS
New Brunswick	911	Ask for Poison Information
Prince Edward Island	800.565.8161 or 902.428.8161	IWK, Halifax, NS
Newfoundland	709.722.1110	Dr. Charles A. Janeway Child Health Care Centre, St. John's, NF

<b>Environmental Emergencies (Pesticide Spills)</b>	
Transport Canada Regional Operations Centre (24 hours)	
Nova Scotia	800.565.1633
New Brunswick	800.565.1633
Prince Edward Island	800.565.1633
Newfoundland	800.563.9089

## ABBREVIATIONS & CONVERSIONS

<b>Formulation and Measurement Abbreviations</b>			
FORMULATIONS		MEASUREMENTS	
DF	Dry flowable	mL	millilitre
EC, E	Oil-based emulsifiable concentrate	kPa	kilopascal
EW	Water-based concentrate	kg	kilogram
EG	Water dispersible granule	g	gram
F	Flowable	L	litre
G	Granule	BIU	Billions of International Units
SC	Suspension concentrate	ppm	parts per million (1000 ppb)
Sn	Solution	ppb	parts per billion (1/1000 ppm)
SP	Soluble powder		
WDG	Wettable dry granule		
WP, W	Wettable powder		

<b>Helpful Conversions<sup>1</sup></b>	
kPa X 0.14 = pounds per square inch (psi)	millilitres X 0.035 = fluid ounces
hectares X 2.47 = acres	litres X 35 = fluid ounces
kilograms X 2.2 = pounds	litres X 0.22 = imperial gallons
kilograms per hectare X 0.89 = pounds per acre	litres per hectare X 14.17 = fluid ounces per acre
kilograms per hectare X 0.40 = kilograms per acre	litres per hectare X 0.40 = litres per acre
	degree-days C X 1.8 = degree-days F

<sup>1</sup> **Pesticide Units of Measurement**

It is not recommended to convert label rates to imperial units because there is a high probability of mathematical and rounding errors. Present day pesticides are formulated to be more effective in smaller amounts. Therefore, even small conversion errors can lead to the use of incorrect rates (either too high or too low). Use metric – you will be glad you did!