GUIDE TO PEST MANAGEMENT IN SPINACH

Nova Scotia Vegetable Crop Guide to Pest Management 2011
[SPIN1-11]

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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
WEEDS:					
Preplant *Perennial weeds including quackgrass*	glyphosate	**Roundup 356 Sn**	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.
		Roundup WeatherMAX	1.67-8.0 L/ha	7	
		Touchdown 480	2.5-7.0 L/ha	7	
	carfentrazone-ethyl	**Aim EC**	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.
Preemergence *Stale Seedbed technique*	paraquat	**Gramoxone 200 Sn**	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	**Reglone 240**	2.3-4.6 L/ha	-	
Postemergence *Grasses*	sethoxydim	**Poast Ultra** plus **Merge**	1.1 L/ha 1-2 L/ha	**15**	Apply to actively growing grasses. One application per year.

	clethodim	**Select** plus **Amigo**	0.19 L/ha plus 0.5 %v/v	14	Apply a maximum of two applications per year.
Inter-row shielded	paraquat	**Gramoxone 200 Sn**	2.75-5.5 L/ha	-	Avoid spraying crop as damage may occur.
	diquat	**Reglone 240**	2.3-4.6 L/ha	-	
	carfentrazone-ethyl	**Aim EC**	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.
INSECTS:					
Leaf Miners	diazinon	**Diazinon 500 E**	1.1 L/ha	10	Use sufficient spray volume to achieve adequate plant coverage
	malathion	**Malathion 25 W**	5.5-7.0 kg/ha	7	
	acetamiprid	**Assail 70 WP**	86 g/ha	7	Max 5 applications/yr. 12 hr re-entry
Aphids	diazinon	**Diazinon 500 E**	1.1 L/ha	10	Inconsistent control of Aphids
	acetamiprid	**Assail 70 WP**	56-86 g/ha	7	Max 5 applications/yr. 12 hr re-entry
	endosulfan	**Thiodan 4 EC**	2 L/ha	14	Max 1 application per season
		Thionex 50 WP	1.75 kg/ha	14	
	dimethoate	**Lagon 480 EC**	700 ml/ha	7	**Swiss Chard only** Max 2 applications/yr.
	naled	**Dibrom**	0.95-1.425 kg/ha	4	Maximum 2 applications per year. Do not re-enter treated sites for 48 hours. Workers must not handle more than 1000L of diluted product per day.
	malathion	**Malathion 25 W**	5.5-7.0 kg/ha	7	Use sufficient spray volume to achieve adequate plant coverage
	Pymetrozine ***Added June 16th***	**FulFill 50WG**	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 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 ***Added June 16th***	**Beleaf 50SG**	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. **Avoid overnight storage of spray mixtures, do not use liquid fertilizer as a carrier and do not use adjuvants.**
Aphids and Whiteflies	spirotetramat	**Movento 240 SC**	220-365 ml/ha	3	Minimum interval between applications is 7 days. Maximum of 730 ml/ha of product applied per season. **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.**
		Movento 150 OD	347-585 ml/ha	3	Minimum interval between applications is 7 days. Maximum of 1.17 L/ha of product applied per season. **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.**
Cabbage looper	spinosad	**Success 480 SC**	0.182 L/ha	3	Max 3 applications/yr.

		Entrust 80 W	109 g/ha	1	Max 3 applications/yr. Allow 7-10 days between applications
	spinetoram	**Delegate WG**	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.
	Bacillus thuringiensis	**Dipel 2X DF**	275-550 g/ha	0	Spinach Only. Looper only
		Thuricide HPC	2.0-4.25 L/ha	0	
	endosulfan	**Thiodan 4 EC**	2 L/ha	14	Max 1 application per season
		Thionex 50 WP	1.75 kg/ha	14	
	naled	**Dibrom**	0.95-1.425 kg/ha	4	Maximum 2 applications per year. Do not re-enter treated sites for 48 hours. Workers must not handle more than 1000L of diluted product per day.
	chlorantraniliprole	**Coragen**	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.
Whitefly (including silverleaf, sweetpotato and greenhouse)	spiromesifen	**Forbid 240 SC**	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.
Aster leafhopper	kaolin	**Surround WP**	12.5-25 kg/ha	-	**This is an OMRI listed control product and is suitable for organic production.** 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.
DISEASES:					
Pythium	metalaxyl-M and s-isomer	**Apron XL LS**	20–40 ml / 100kg of seed	-	One application as a seed treatment Do not apply to leafy greens that are destined to be grown in the greenhouse.
Downy Mildew	azoxystrobin	**Quadris**	1.125 L/ha	7	Max 2 application/yr. Begin applications prior to disease establishment and repeat at 7 day intervals
	copper sulfate	**Copper 53W**	2.5-3 kg/ha	1	Apply at 7-10 day intervals
	mandipropamid	**Revus** plus **Non-ionic adjuvant**	400-600 ml/ha plus 0.125% v/v	1	**For control of Downy Mildew and Blue Mold.** 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.
	boscalid, pyraclostrobin	**Pristine WG**	1.6 Kg/ha	0	**For suppression of Downy mildew.** Apply when disease first appears. Follow 5-7 days later with a fungicide of a different mode of action. Do ont make sequential applications of Pristine. Maximum of 2 applications per year. REI = 24hrs. For hand harvesting and thinning in leafy vegetables do not enter for 9 days after application.
	metalaxyl-M and S-isomer	**Ridomil Gold 480 EC**	1 L/ha	-	Apply at planting as a banded application over the row, pre-plant incorporated application. Apply one application per season.
	fluopicolide	**Presidio**	220-292 ml/ha	2	**Apply in 200-1000 l/ha.** For resistance management, Presidio Fungicide must be tank-mixed with a labelled rate of another fungicide

					registered for the target pathogen, but with a different mode of action. Apply Presidio Fungicide in a tank mix with Aliette. Follow the most restrictive use directions of either label. 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.
White rust *(Albugo occidentalis)*	*Bacillus subtilis*	**Serenade MAX**	1.0-2.0 Kg/ha	0	**Serenade Max and Serenade ASO are biopesticides that will only suppress the indicated diseases.** 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.
		Serenade ASO	4.0-8.0 L/ha	0	
Sclerotinia rot ***(Sclerotinia sclerotiorum, Sclerotinia minor)***	*Bacillus subtilis*	**Rhapsody ASO**	**1.0-2.0 L/100 L of water**	**0**	**Rhapsody ASO is a biopesticide that will only suppress the indicated diseases.** **Head and leaf drop: 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.**

	boscalid, pyraclostrobin	**Pristine WG**	**1.0 – 1.3 Kg/ha**	0	**For suppression of white mold.** Apply once per season before disease develops. REI = 24hrs. For hand harvesting and thinning in leafy vegetables do not enter for 9 days after application.
Grey mould *(Botrytis cinerea)*	*Bacillus subtilis*	**Rhapsody ASO**	1.0-2.0 L/100 L of water	0	**Rhapsody ASO is a biopesticide that will only suppress the indicated diseases**. 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 Rhapsody ASO in a rotational program with other registered fungicides. Thorough coverage is essential.
Powdery mildew *(Erysiphe cichoracearum)*	*Bacillus subtilis*	**Rhapsody ASO**	1.0-2.0 L/100 L of water	0	**Rhapsody ASO is a biopesticide that will only suppress the indicated diseases**. Begin applications when conditions are conducive to disease development. Repeat as necessary on a 7 to 10 day interval. Apply in sufficient water to ensure complete coverage of entire plant. For improved performance use Rhapsody ASO in a rotational program with other registered fungicides.

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

PESTICIDE EMERGENCY CONTACT INFORMATION

Poison Control Centres		
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

Environmental Emergencies (Pesticide Spills)	
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

Formulation and Measurement Abbreviations			
FORMULATIONS		MEASUREMENTS	
DF	Dry flowable	mL	millilitre
EC, E	Oil-based emulsifiable concentrate	kPa	kilopascal
EW	Water-based concentrate	kg	kilogram
SC	Suspension concentrate	g	gram
Sn	Solution	L	litre
WP, W	Wettable powder	BIU	Billions of International Units
		ppm	parts per million (1000 ppb)
		ppb	parts per billion (1/1000 ppm)

Helpful Conversions[1]	
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

[1] **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!