

2020



EXTENSION AND ADVISORY TEAM

GUIDE TO PEST MANAGEMENT IN GARLIC

Nova Scotia Vegetable Crop Guide to Pest Management 2020
[GAR1-20]



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IMPORTANT

This publication was compiled by representatives from Perennia 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, Perennia 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, Perennia 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 | Group | Active Ingredient | Pesticide Product Name | Rate | Restricted Entry Interval (REI) | Pre-harvest Interval (days) | Remarks |
|--|-------|---------------------|---------------------------|----------------|---------------------------------|-----------------------------|--|
| WEEDS: | | | | | | | |
| Preplant <i>Perennial weeds including quackgrass</i> | 9 | glyphosate | Roundup WeatherMAX | 1.67-8.0 L/ha | 12 hours | - | 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 with fall application of these herbicides. |
| | | | Touchdown 480 | 2.5-7.0 L/ha | 12 hours | - | |
| | 14 | carfentrazone-ethyl | Aim EC | 36.5-117 mL/ha | 12 hours | 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 | 3 | chlorthal dimethyl | Dacthal W-75 | 9.0-18.0 Kg/ha | 12 hours | - | Apply at seeding or at transplanting. |
| | 15 | napropamide | Devrinol 50 DF | 2.25-4.5 Kg/ha | 12 hours | 60 | Apply only one application per season. |
| | 14 | Flumioxazin | Chateau WDG | 280-420 g/ha | 12 hours | - | Apply prior to emergence of garlic, and within 3 days after planting garlic. Severe crop injury will result when |

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| | | | | | | | soils are flooded following applications of Chateau. Apply only once per growing season. Use appropriate water volumes to ensure good spray coverage. This product will not control emerged weeds. Do not apply on soils with > 5% OM, or fine-textured soils. |
| Postemergence <i>Grasses</i> | 1 | sethoxydim | Poast Ultra plus Merge | 0.32-1.1 Kg/ha 1-2 L/ha | 12 hours | 50 | Apply postemergence to annual grasses in the 1 to 6 leaf stage. Apply at 1.1 L/ha for quackgrass control. |
| | 1 | Clethodim | Select | 0.38 L/ha + 0.5% v/v Amigo Adjuvant | 12 hours | 45 | Post-emergence application when the crop is in the 1 to 4 leaf stage. One application per season. |
| <i>Broadleaf weeds</i> | 6 | bromoxynil | Pardner (280 g/L) | 1.0 L/ha | 24 hours | 58 | Apply in 200 to 300 L/ha of water, early postemergence to weeds. Only one application per year. |
| | 3 | Pendimethalin | Prowl H₂O | 2.2-3.3 L/ha 6.6 L/ha | 5 days | 45 | Muck soils. 6.6 L/ha. After the crop has emerged, up to the 4 true-leaf stage of garlic growth. Maximum of two applications per year (minimum 3 weeks interval between applications). Mineral soils. 2.2-3.3 L/ha. Apply after the crop has emerged, up to the 4 true-leaf stage. |
| <i>Inter-row shielded</i> | 22 | paraquat | Gramoxone 200 Sn | 2.75-5.5 L/ha | 12 hours | - | Do not spray solution on the crop plant since it could be injured or killed. Use Gramoxone for best control of grasses. |
| | | diquat | Reglone, Dessicash | 2.3-4.6 L/ha | 24 hours | - | |
| | 14 | carfentrazone-ethyl | Aim EC | 36.5-117 mL/ha | 12 hours | 1 | Apply in minimum spray volume of 100 L/ha. Refer to label for target weeds, buffer zones and rates. Use |

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| | | | | | | | high flow rate nozzles to apply the highest spray volume. |
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|-----------------|----------|--------------------|----------------------------------|----------------|---------------------------------|--|---|
| INSECTS: | | | | | | | |
| Thrips | 3 | lambda-cyhalothrin | Matador 120 EC Or Labamba | 188 mL/ha | 24 hours | 14 | Thrips only – 3 applications per season. |
| | 1B | malathion | Malathion 85E | 535-1345 mL/ha | 12 hours | 3 | Apply in enough spray volume to provide adequate coverage. Max. 1 application per year. Also controls aphids. |
| | 5 | spinetoram | Delegate WG | 200-336 g/ha | 12 hours | 3 | Suppression only. Recommended water volume of 300-500 L water/ha with sufficient pressure to ensure spray solution penetrates leaf axils. Apply when thrips first appear targeting eggs at hatch and small nymphs. Use higher applications when insect pressure high or insects at advanced stage of growth. Maximum 3 applications per year with 7-10 days between treatments. Do not apply 2 consecutive applications of group 5 insecticides. Rotate to another class of insecticide for at least one application. Do not apply within 3 days to Harvest. |
| | | | Success 480SC | 218-262 ml/ha | | | |
| | | | Entrust 80W | 131-158 g/ha | | | |
| | Spinosad | Entrust SC | 437-527 ml/ha | When dry | 3 | Suppression only. Target small nymphs and eggs at hatching. Allow 7-10 days between applications. Max 3 applications per year. Apply in 300-500 L/ha. | |

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| | 23 | Spirotetramat | Movento 240 SC | 365 mL/ha | 12 hours | 3 | Apply when thrips are first noticed. Should be used during the first half of the season when adult populations are relatively low or building. Reductions in numbers of thrips larvae may take 3 to 4 days after application. | |
| | 28 | Cyantraniliprole | Exirel | 1000-1500 ml/ha | 12 hours | 1 | Suppression only. Begin applications when thrips populations are low. Thorough coverage is essential for optimum control. For optimum control, apply Hasten NT Spray Adjuvant* at an application rate of 0.25% v/v or MSO Contentrate with Leci-Tech* at an application rate of 0.5% v/v. If thrips populations are high, use a registered insecticide with a different mode of action to reduce thrips populations before applying Exirel. Do not make more than 4 applications per season. Do not apply more than once every 5 days. | |
| | 6 | Abamectin | Agri-Mek 1.9% EC | 0.6-1.2 L/ha | When dry | 30 | Should be applied with a non-ionic surfactant to improve wetting of foliage and to smooth out spray deposits. Spreading and penetrating surfactants can improve insect control. Do not use binder or sticker-type surfactants. Max 3 applications/season. | |
| | | | Agri-Mek SC | 135-270 mL/ha 0.25-0.5% v/v non-ionic surfactant | 12 hours | | | |
| Onion maggots | 1B | chlorpyrifos | Lorsban 4 E Pyrinex 480 EC Warhawk 480 EC | 3.5 L/ha in 1000 L water | 24 hours | 50 | Apply as soil drench banded over the seedling row. | |
| Cutworms | 1B | chlorpyrifos | Pyrinex 480 EC | | 1.2-2.4 L/ha | 24 hours | 50 | Apply once per season as soil or seedling treatment. Make an application 3-7 days |

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| | | | Warhawk 480 EC | | | | before planting or at the 2-5 leaf stage when damage is observed. |
| Leek Moth | 5 | spinetoram | Delegate WG | 200-336 g/ha | 12 hours | 3 | Suppression. Recommended water volume of 300-500 L water/ha with sufficient pressure to ensure spray solution penetrates leaf axils. Apply when thirps first appear targeting eggs at hatch and small nymphs. Use higher applications when insect pressure is high or when insects are at advanced stage of growth. Maximum 3 applications per year with 7-10 days between treatments. Do not apply 2 consecutive applications of group 5 insecticides. Rotate to another class of insecticide for at least one application. |
| | | Spinosad | Success 480 SC | 218-262 ml/ha | When dry | 3 | Suppression. Apply in high water volume to ensure spray solution penetrates into leaf axils. Reapply at 7-10 day intervals. Do not apply more than 2 sequential applications. Max 3 applications per year. Target eggs at hatch or small larvae. |
| | | | Entrust 80W | 131-158 g/ha | | | |
| | Entrust SC | 437-527 ml/ha | | | | | |
| | 11 | <i>Bacillus thuringiensis</i> , subsp. <i>aizawai</i> , | XenTari WG | 500-1000 g/ha | 4 hours | 0 | Apply sufficient spray volume to ensure uniform deposition on all plant surfaces; recommend 1000 L per ha. |
| 3 | lambda- cyhalothrin | Matador 120 EC Labamba | 188 mL/ha | 24 hours | 14 | Timing of application should be based on the presence of vulnerable pest developmental stages and significant populations as determined by local monitoring. | |

| Pest | Group | Active Ingredient | Pesticide Product Name | Rate | Restricted Entry Interval (REI) | Pre-harvest Interval (days) | Remarks |
|---|-------|----------------------------|-------------------------|----------------|--------------------------------------|-----------------------------|---|
| DISEASES: | | | | | | | |
| Purple blotch <i>Alternaria</i> | 7 | boscalid | Cantus WDG | 475 g/ha | 12 hours | 7 | Maximum 6 applications/year. No more than two applications in succession without rotating to different fungicide family. |
| | 11 | pyraclostrobin | Cabrio EG | 560-840 g/ha | 12 hours | 7 | Maximum 2 sequential applications. Maximum total of 3 applications. |
| | 7-11 | boscalid & pyraclostrobin | Pristine WG | 1-1.3 Kg/ha | 3 days | 7 | Maximum 6 applications per growing season. Apply at 7-14 day intervals. |
| | 7 | penthiopyrad | Fontelis | 1.25-1.75 L/ha | 12 hours | 3 | Begin applications prior to disease development, continue on a 7-10 day interval. Use higher rate and shorter interval when disease pressure is high. Max seasonal rate is 5.25 L/ha. Make no more than 2 sequential applications before switching to another mode of action. |
| | 9-12 | Cyprodinil and Fludioxinil | Switch 62.5 WG | 775-975 g/ha | 12 hours 3 days (hand weeding) | 7 | Suppression. Begin when conditions are favorable for disease but before infection. Maximum 3 applications/yr. Apply at 7-14 day intervals. Suppression of purple blotch only. |
| | 7-9 | Fluopyram & pyrimethanil | Luna Tranquility | 1200 ml/ha | 12 hours | 7 | Begin fungicide applications preventatively. Continue as needed, on a 7- 12 day interval. |
| | 7 | Benzovindiflupyr | Aprovia | 750 ml/ha | 12 hours | 7 | Begin applications when the plants are 5-10 centimeters high or when conditions become favourable for disease |

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| | | | | | | | development. Make applications on a 7 – 14 days interval. Use the shorter interval when conditions are more conducive to disease. Also controls garlic rust (<i>Puccinia allii</i>). |
| Botrytis and Stemphylium leaf blights | 7-11 | boscalid & pyraclostrobin | Pristine WG | 1-1.3 Kg/ha | 3 days | 7 | Botrytis. Max 6 applications/growing season. Apply at 7-14 day intervals. Do not make sequential applications when downy mildew occurs. |
| | 7 | boscalid | Cantus WDG | 0.475 Kg/ha | 12 hours | 7 | Botrytis. Maximum 6 applications per year. No more than two applications in succession without rotating to different fungicide family. |
| | 44 | <i>Bacillus subtilis</i> | Serenade Opti | 1.7-2.5 Kg/ha | - | 0 | Suppression of Botrytis. Also suppresses Botrytis neck rot. 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. |
| | 9-12 | Cyprodinil and Fludioxinil | Switch 62.5 WG | 775-975 g/ha | 12 hours 3 days (hand weeding) | 7 | Botrytis Maximum of 3 applications/yr. Begin when conditions are favorable for disease but before infection. Apply at 7-14 day intervals, no more than 2 sequential applications. |
| | M1 | Copper | Cueva | 0.5% -2% solution, applied at 470-940 L/ha | 4 hours | 1 | Botrytis. Re-apply using 5-10 day intervals. |
| | 7-9 | Fluopyram & pyrimethanil | Luna Tranquility | 1200 ml/ha | 12 hours | 7 | Botrytis and Stemphylium. Begin fungicide applications preventatively. Continue as needed, on a 7- to 12-day interval. Apply maximum of 2 applications per season for Botrytis. |
| | 7 | Benzovindiflupyr | Aprovia | 750 ml/ha | 12 hours | 7 | Suppression of Stemphylium. Begin applications when the plants are 5-10 |

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| | | | | | | | centimeters high or when conditions become favourable for disease development. Make applications on a 7 – 14 days interval. Use the shorter interval when conditions are more conducive to disease. |
| | 11,3 | Azoxystrobin, difenoconazole | Quadris Top | 710-1000 mL/ha | 12 hours | 7 | Control of Botrytis, suppression of Stemphylium. Apply no more than 1 application to target this <i>stemphylium</i> . Apply as a broadcast foliar spray in sufficient water for thorough coverage. A minimum spray volume of 150 L/ha is recommended. Apply on a 7 to 14 day interval, starting prior to disease onset when conditions are conducive to disease. |
| Downy Mildew | 11 | fenamidone | Reason 500 SC | 400 ml/ha | When dry | 7 | Suppression Only. Begin application as soon as crop and/or environmental conditions become favourable for disease development. Apply in 300-600 L/ha. Applications should be made on a 5-10 day interval. Maximum 4 applications per year. Plant back interval of 30 days. Do not apply more than 2 sequential applications of Reason 500 SC or any other Group 11 fungicide before alternating with a fungicide from a different Group. |
| | 11 | pyraclostrobin | Cabrio EG | 0.56-0.84 Kg/ha | 3 days (thinning), 12 hours (general) | 7 | Maximum 2 sequential applications. Maximum 3 applications/yr. |
| | 44 | <i>Bacillus subtilis</i> | Serenade Opti | 1.7-3.3 Kg/ha | - | 0 | Biopesticide that will only suppress the indicated diseases. Begin applications at the first sign of disease, or when conditions become conducive for disease |

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| | | | | | | | development. Repeat as necessary on a 7-10 day interval. |
| | 7-11 | boscalid & pyraclostrobin | Pristine WG | 1-1.3 Kg/ha | 3 days (thinning), when dry (general) | 7 | Maximum 6 applications per growing season. Apply at 7-14 day intervals. Do not make sequential applications of Pristine WG when downy mildew occurs. Suppression only of downy mildew. |
| | 40 | Mandipropamid | Revus | 400 mL/ha | 12 hours | 7 | Applications should begin prior to disease development and continue throughout the season on a 7 day schedule of fungicides, following the resistance management guidelines. The use of a non-ionic adjuvant (0.25% v/v) or mineral oil at 1.0% v/v is recommended. |
| | 40, 49 | Mandipropamid, oxathiapiprolin | Orondis Ultra | 400 mL/ha | 12 hours | 7 | Begin applications prior to disease development and continue on a 7 to 10 day interval. Use shorter interval when disease pressure is high. The use of a penetrating surfactant is recommended. |
| | 40,45 | Ametoctradin, dimethomorph | Zampro | 1.0 L/ha | Hand harvesting –1 day All other activities – 12 hours | 0 | In order to reduce the risk of the development of fungicide resistance Zampro must be used in rotation with other fungicides having a different mode of action active against downy mildew. Begin applications of Zampro prior to disease development and continue on a 5-7-day interval. Max 3 applications. |
| | M1 | Copper | Cueva | 0.5% to 2% solution, applied at 470-940 L/ha | 4 hours | 1 | Re-apply using 5-10 day intervals. |
| | 33 | Mono- and dibasic sodium, potassium, and ammonium | Phostrol | 2.9-4.3 L/ha | 12 hours | 0 | <u>For preventative suppression of downy mildew</u> begin foliar applications when conditions favouring disease development exist and continue on a 7-14 day interval. |

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| | | phosphites | | | | | Do not apply more than 7 applications per year. |
| | U15 | Oxathiapiprolin | Zorvec - Enicade | 0.0875-0.35 L/ha | 12 hours | 0 | Begin applications prior to disease development and continue on a 5 to 10 day interval. Use higher rate and shorter interval when disease pressure is high. |

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.hc-sc.gc.ca/lr-re/index-eng.php>

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 |
| EG | Water dispersible granule | kg | kilogram |
| WG | Wettable granule | g | gram |
| WDG | Wettable dry granule | L | litre |
| WP, W | Wettable powder | BIU | Billions of International Units |
| Sn | Solution | ppm | parts per million (1000 ppb) |
| | | ppb | parts per billion (1/1000 ppm) |

| Helpful Conversions¹ | |
|---|--|
| 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!