2022 Pest Management Research Report
(PMRR)
2022 Growing Season

2022 Rapport de recherches sur la lutte dirigée
(RRLD)
pour la saison 2022

English

2020 PEST MANAGEMENT RESEARCH REPORT

Prepared by: Pest Management Centre, Agriculture and Agri-Food Canada
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[1] This is the 23rd year that the Report has been issued a volume number. It is based on the number of years that it has been published. See history on page iii.

This annual report is designed to encourage and facilitate the rapid dissemination of pest management research results, particularly of field trials, amongst researchers, the pest management industry, university and government agencies, and others concerned with the development, registration and use of effective pest management strategies. The use of alternative and integrated pest management products is seen by the ECIPM as an integral part in the formulation of sound pest management strategies. If in doubt about the registration status of a particular product, consult the Pest Management Regulatory Agency, Health Canada, at 1-800-267-6315.

This year there were 7 reports. Agriculture and Agri-Food Canada is indebted to the researchers from provincial and federal departments, universities, and industry who submitted reports, for without their involvement there would be no report. Special thanks are also extended to the section editors for reviewing the scientific content and merit of each report. Please note, that these reports are not peer reviewed. Standards regarding the quality of submitted reports are left up to the judgement of the section editors and the report authors. AAFC-AAC does not endorse the content of these reports.

Suggestions for improving this publication are always welcome.

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Pest Management Research Report History.

1961 - The National Committee on Pesticide Use in Agriculture (NCPUA) was formed by its parent body, the National Coordinating Committee of Agricultural Services. It had three main duties: to define problems in crop and animal protection and to coordinate and stimulate research on pesticides; to establish principles for drafting local recommendations for pesticide use; and to summarize and make available current information on pesticides.

1962 - The first meeting of the NCPUA was held, and recommended the Committee should provide an annual compilation of summaries of research reports and pertinent data on crop and animal protection involving pesticides. The first volume of the Pesticide Research Report was published in 1962.

1970 - The NCPUA became the Canada Committee on Pesticide Use in Agriculture (CCPUA).

1978 - Name was changed to the Expert Committee of Pesticide Use in Canada (ECPUA).

1990 - The scope of the Report was changed to include pest management methods and therefore the name of the document was changed to the Pest Management Research Report (PMRR). The committee name was the Expert Committee on Pest Management (1990-1993) and the Expert Committee on Integrated Pest Management since 1994.

2006 - The Expert Committee on Integrated Pest Management was disbanded due to lack of funding.

2007 - Agriculture and Agri-Food Canada agreed temporarily to take over responsibility for funding and compilation of the Pest Management Research Report until an organisation willing to assume permanent responsibility was found.

The publication of the Report for the growing season 2022 has been assigned a Volume number for the 23rd year. Although there was a name change since it was first published, the purpose and format of the publication remains the same. Therefore, based on the first year of publication of this document, the Volume Number will be Volume 61.

An individual report will be cited as follows:
Author(s). 2022. Title. 2022 Pest Management Research Report - 2022 Growing Season. Agriculture and AgriFood Canada. May 2023. Report No. x. Vol. 61: pp-pp.

Français

Rapport de recherches sur la lutte dirigée - 2022

Préparé par: Centre de la lutte antiparasitaire, Agriculture et Agroalimentaire Canada
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Titre officiel du document

2022 Rapport de recherches sur la lutte dirigée - pour la saison 2022. Compilé par Agriculture et Agroalimentaire Canada, 960 avenue Carling, Ed. 57, Ottawa ON K1A 0C6, Canada
Mai 2023 volume 61[1]. 35 pp. 10 rapports.
Publié sur Internet à http://phytopath.ca/publication/pmrr/

[1]Ce numéro est basé sur le nombre d'année que le rapport a été publié. Voir l'histoire en page iv.

La compilation du rapport annuel vise à faciliter la diffusion des résultats de la recherche dans le domaine de la lutte antiparasitaire, en particulier les études sur la terrain, parmi les chercheurs, l'industrie, les universités, les organismes gouvernementaux et tous ceux qui s'intéressent à la mise au point, à l'homologation et à l'emploi de stratégies antiparasitaires efficaces. L'utilisation de produits de lutte intégrée ou de solutions de rechange est perçue par Le Comité d'experts sur la lutte intégrée (CELI) comme faisant partie intégrante d'une stratégie judicieuse en lutte antiparasitaire. En cas de doute au sujet du statut d'enregistrement d'un produit donné, veuillez consulter Santé Canada, Agence de réglementation de la lutte antiparasitaire à 1-800-267-6315.

Cette année, nous avons donc reçu 8 rapports. Les membres du Comité d'experts sur la lutte intégrée tiennent à remercier chaleureusement les chercheurs des ministères provinciaux et fédéraux, des universités et du secteur privé sans oublier les rédacteurs, qui ont fait la révision scientifique de chacun des rapports et en ont assuré la qualité. Veuillez noter que ces rapports ne sont pas évalués par des pairs. Les normes concernant la qualité des rapports soumis sont laissées à l'appréciation des rédacteurs de section et des auteurs des rapports. AAFC-AAC n'approuve pas le contenu de ces rapports.

Vos suggestions en vue de l'amélioration de cette publication sont toujours très appréciées.

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Historique du Rapport de recherche sur la lutte dirigée

Le Comité national sur l'emploi des antiparasitaires en agriculture (CNEAA) a été formé en 1961 par le Comité national de coordination des services agricoles. Il s'acquittait d'un triple mandat: cerner les problèmes touchant la protection des cultures et des animaux et coordonner et stimuler la recherche sur les pesticides; établir des principes pour l'élaboration de recommandations de portée locale sur l'utilisation des pesticides; synthétiser et diffuser l'information courante sur les pesticides.

À la première réunion du CNEAA, en 1962, il a été recommandé que celui-ci produise un recueil annuel des sommaires des rapports de recherche et des données pertinentes sur la protection des cultures et des animaux impliquant l'emploi de pesticides. C'est à la suite de cette recommandation qu'a été publié, la même année, le premier volume du Rapport de recherche sur les pesticides.

En 1970, le CNEAA est devenu le Comité canadien de l'emploi des pesticides en agriculture. Huit ans plus tard, on lui a donné le nom de Comité d'experts de l'emploi des pesticides en agriculture. En 1990, on a ajouté les méthodes de lutte antiparasitaire aux sujets traités dans le rapport, qui est devenu le *Rapport de recherche sur la lutte dirigée*. Par la suite, le nom du comité a changé deux fois: Comité d'experts de la lutte antiparasitaire de 1990 à 1993 puis, en 1994, Comité d'experts de la lutte antiparasitaire intégrée.

En 2000, on a commencé à attribuer un numéro de volume au rapport annuel. Même si ce dernier a changé de titre depuis sa création, sa vocation et son format demeurent les mêmes. Ainsi, si l'on se reporte à la première année de publication, le rapport portant sur la saison de croissance de 2009 correspond au volume 48.

En 2006, le Comité d'experts de la lutte antiparasitaire intégrée a été dissous en raison du manque de financement.

En 2007, Agriculture et Agroalimentaire Canada assume temporairement la responsabilité du financement et de la compilation du Rapport de recherche sur la lutte dirigée jusqu'à ce qu'une organisation désireuse d'assumer la responsabilité pour ce rapport sur une base permanente soit déterminée.

Modèle de référence:
Nom de l'auteur ou des auteurs. 2022. Titre. 2022 Rapport de recherche sur la lutte dirigée. Agriculture et Agroalimentaire Canada. Mai, 2023. Rapport n^{o} x. vol. 61: pp-pp.

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2022 PMR REPORT # 1

CROP: Wine Grape *(Vitis vinifera)*, cv. Sauvignon Blanc
PEST: Cottony Vine Scale *(Pulvinaria vitis)*

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TITLE: EFFICACY OF SIVANTO PRIME (FLUPYRADIFURONE) FOR THE CONTROL OF SOFT SCALE ON GRAPES (WINE)

MATERIALS: SIVANTO PRIME INSECTICIDE (flupyradifurone 200 g/L), MOVENTO 240 SC INSECTICIDE (spirotetramat 240 g/L), AGRAL 90 (nonylphenoxy polyethoxy ethanol 92%), HORTICULTURAL OIL (mineral oil 99%)

METHODS: The trial was conducted in a Sauvignon Blanc vineyard at Agriculture and Agri-Food Canada's Summerland Research & Development Centre in 2022. The vineyard consists of mature vines trained in a bilateral vertical shoot position trellis system. Vines were spaced 2.4 m (8 ft) between rows and 1.2 m (4 ft) within the row. The vineyard has been maintained for research purposes in a commercially representative manner. The treatments were an untreated control, SIVANTO PRIME, MOVENTO 240 SC with a non-ionic surfactant, and SIVANTO PRIME with a horticultural oil. Treatments were arranged in a randomized complete block design with 4 replicate plots per treatment and 5 vines per plot. On 23 June 2022 scouting for *Pulvinaria vitis* occurred and egg masses were moved to ensure two egg masses were present on each vine in the trial plots. Application occurred on 12 July 2022 with an over-the-row recirculating sprayer using a 1000 L/ha target volume. Post-treatment assessments were conducted on 8 and 15 August 2022; 27 and 34 days post treatment, respectively. For each assessment date, 20 leaves from each plot were removed from vines and taken to the lab for further analysis. Using a microscope, *P. vitis* nymphs were counted on the leaf bottom, leaf top and leaf petiole. Data were entered into ARM software (revision 2022.2) and analyzed using Tukey's HSD (p=0.05) for mean separation.

RESULTS: As outlined in Table 1

CONCLUSIONS: No phytotoxic effects were observed in any of the treatments. SIVANTO PRIME applied alone or applied with 0.25% v/v horticultural oil reduced the populations of *P. vitis* compared to the untreated control. These treatments performed as well as MOVENTO SC 240 applied with AGRAL 90.

ACKNOWLEDGEMENTS: Thank you to Daniel Ulrich, Douglass Weddell, Andrea Brauner, and research assistants Max Bailey, Clay Roper-Daniels, Jashone Krahn, Melanie Martens and Benjamin Miller.

Table 1. Average number of *P. vitis* nymphs per leaf from 40 Sauvignon Blanc leaves per plot after treatment, 20 leaves assessed on both 8 and 15 August 2022; 27 and 34 days post treatment, respectively.

Treatment	Rate	Number of Applications	Average Number of *P. vitis*/leaf [1] (% control)[2]
Check	0	0	1.4 a (0 %)
SIVANTO PRIME	1000 ml/ha	1	0.4 b (74.4%)
MOVENTO SC 240 + AGRAL 90	460 ml/ha + 0.2% v/v	1	0.1 b (91.9%)
SIVANTO PRIME + HORTICULTURAL OIL	1000 ml/ha + 0.25% v/v	1	0.1 b (93.7%)

[1] Numbers in a column followed by the same letter are not significantly different at $P = 0.05$, Tukey's HSD.
[2] Automatic percent control; Control forced to 0% on AOV means table.

2022 PMR REPORT #2

CROP: Garlic (*Allium sativum* L.), Leek (*Allium porrum* L.)
PEST: Leek Moth (*Acrolepiopsis assectella* (Zeller))

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TITLE: SURVEY OF LEEK MOTH POPULATIONS IN ONTARIO, 2022

MATERIALS: DELTA 1 Pheromone trap, lure #40AS009.

METHODS: DELTA 1 pheromone traps with a leek moth (*Acrolepiopsis assectella*) lure #40AS009 (Distributions Solida, Montreal, Quebec) were set up in 11 locations in nine counties in Southwestern Ontario from 24 April to 10 May, 2022. Counties surveyed include Brant, Chatham-Kent, Essex, Grey, Huron, Oxford, Perth and Renfrew. Two traps were hung on wooden stakes approximately 40 cm above the ground in every field monitored. Thirteen of the fields surveyed were planted with garlic and one field in Perth County was planted with leek. If onions were grown nearby, traps were moved from garlic to onions once the garlic was harvested. Sticky cards were changed weekly while pheromone lures were changed every two weeks during the duration of the study. Specimens were counted visually without extracting genitalia. Traps were left in several fields after garlic harvest to capture the third flight of the season. In the leek field, the traps were left until 1 September.

RESULTS: As outlined in **Figures 1-6**.

CONCLUSIONS: Leek moth were detected at all locations surveyed during the 2022 field season except at the Essex field site. Like previous years, field sites had three distinct population spikes between May and September when they were monitored for the entire season. The three distinct peaks taken from the average of all locations appear to be mid-May, early-July, and mid-August. Results suggest that leek moth can be managed by insecticides in commercial garlic fields if insecticides are applied three to 10 days after second peak trap capture. Exclusion nets used alone (no conventional insecticides applied) were not effective as leek moth were found under the nets at the Renfrew County site. More data are required to determine the long term affects of parasitic wasps at the locations in Perth County.

ACKNOWLEDGEMENTS: Thank you to Brittney Littlefield, Joseph Roy, Hannah Fraser, Dennis Van Dyk, and Josh Mosiondz for their help throughout the growing season.

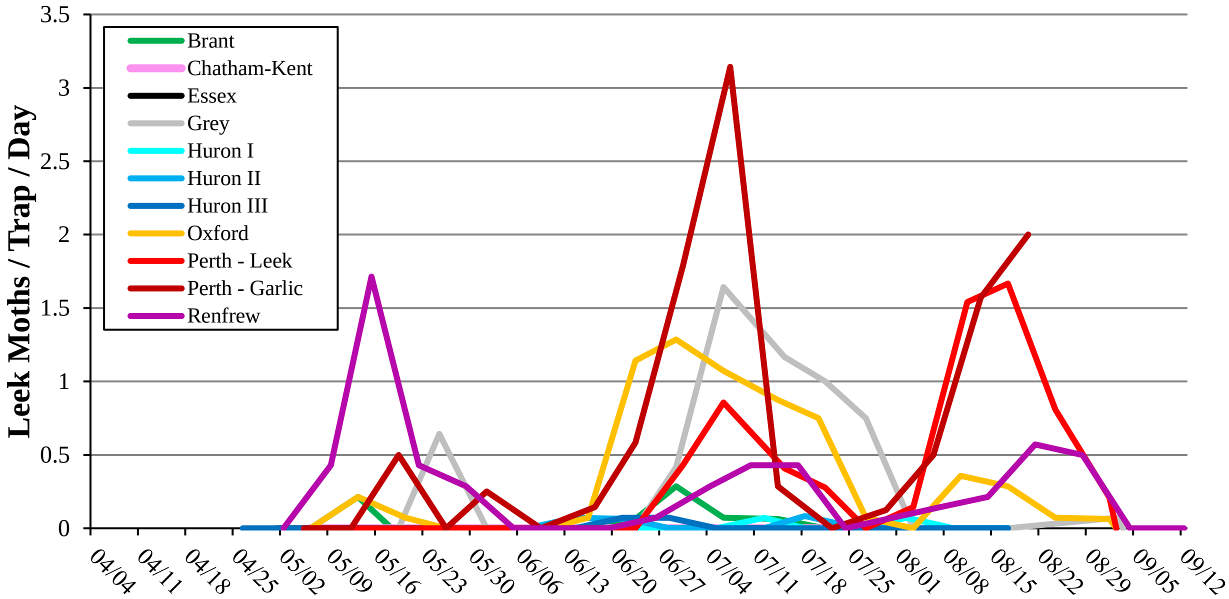


Figure 1. Average number of leek moths per sticky trap per day at 10 garlic fields and one leek field within the surveyed counties of Brant, Grey, Huron, Oxford, Perth, and Renfrew, 2022. No leek moths were observed in Chatham-Kent or Essex Counties.

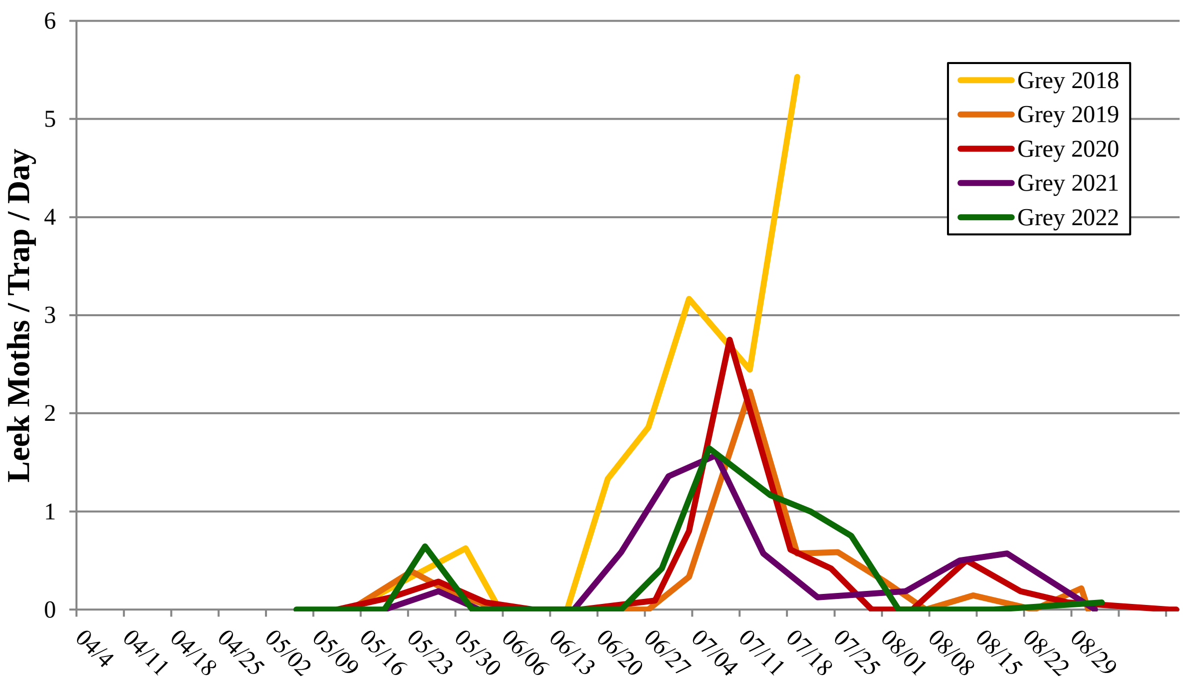


Figure 2. Leek moth counts in Grey County in 2022 (green), 2021 (purple), 2020 (red), 2019 (orange), and 2018 (yellow) with two insecticide applications following the second peak each year. Monitoring stopped in 2018 following garlic harvest, however, monitoring continued until September in 2019-2022.

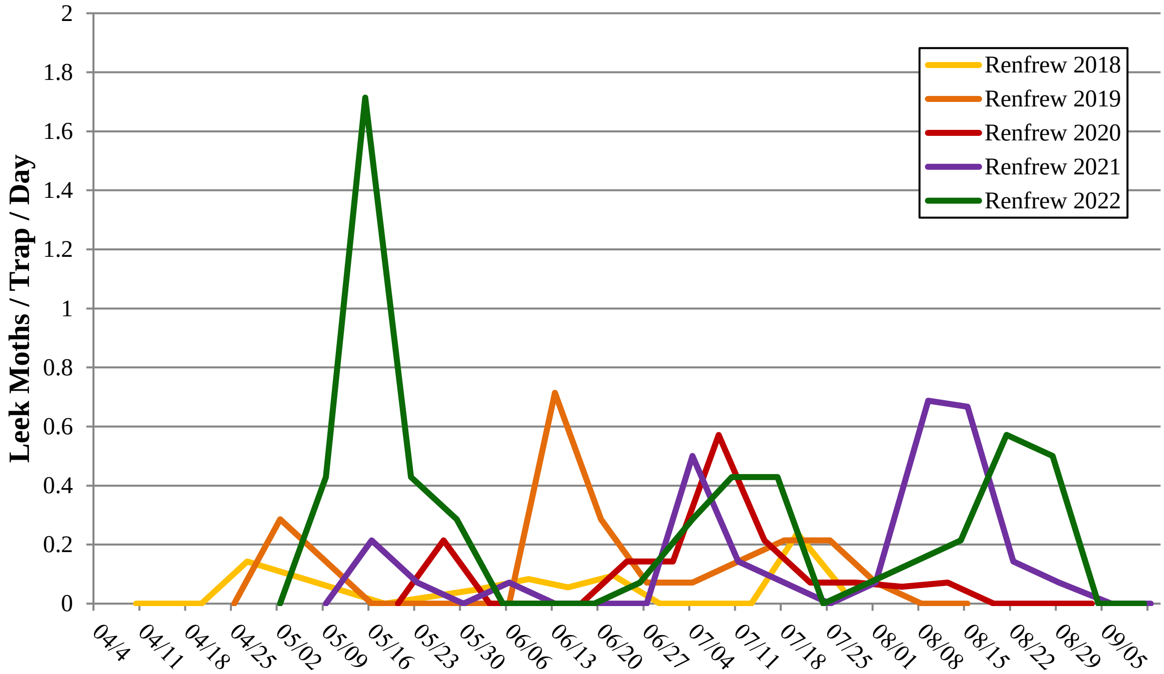
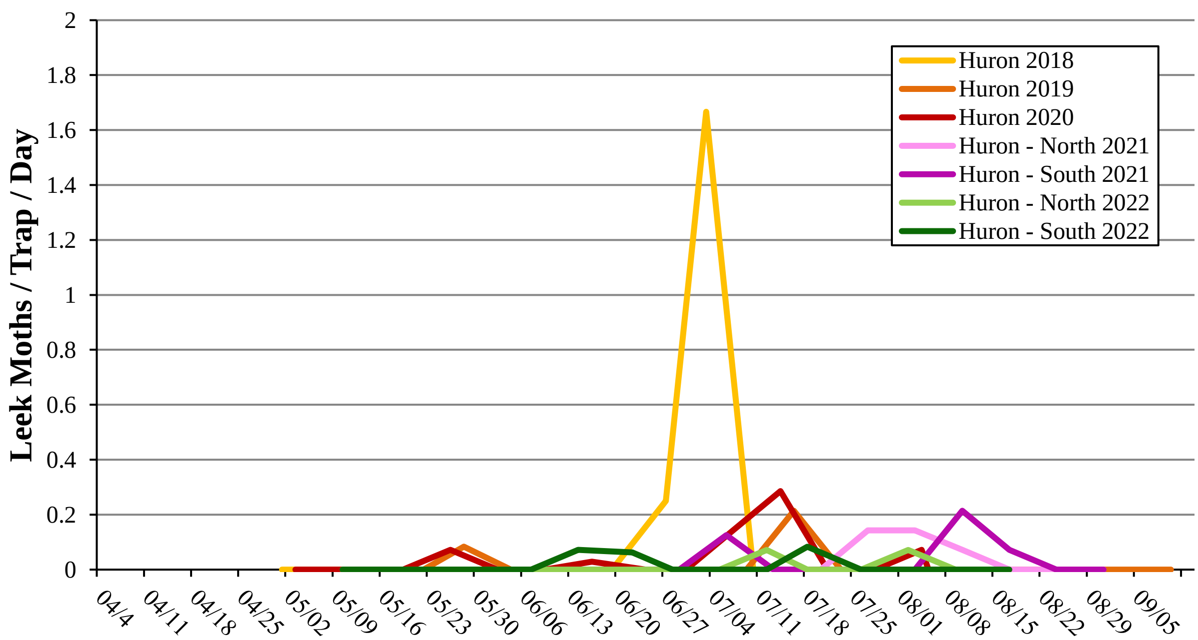


Figure 3. Leek moth counts in Renfrew County in 2022 (green), 2021 (purple), 2020 (red), 2019 (orange), and 2018 (yellow). No insecticides were applied 2018-2022, however, exclusion nets were implemented in 2021 onward.



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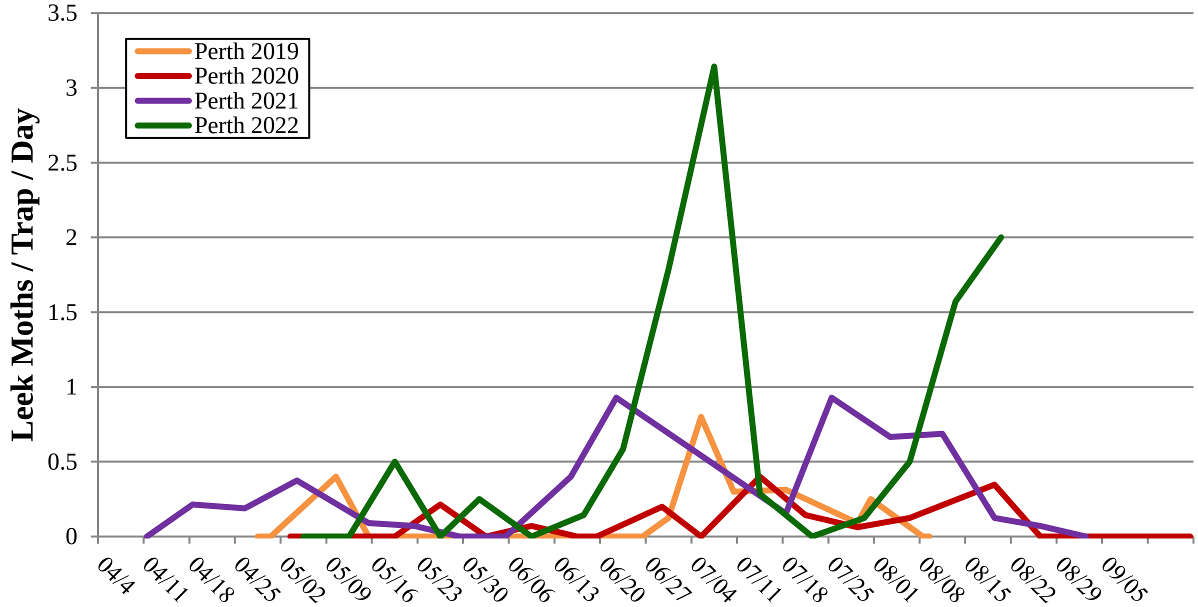
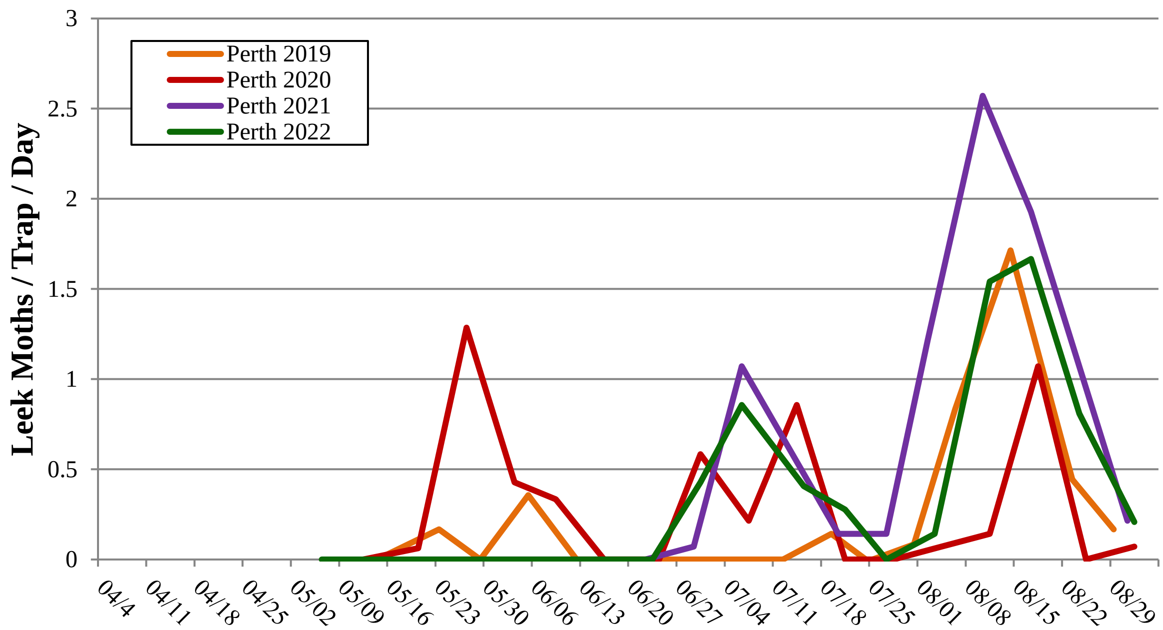


Figure 5. Leek moth counts where garlic was grown within 500 m of the previous year's field in Perth County in 2022 (green), 2021 (purple), 2020 (red), and 2019 (orange). No insecticides were applied, however female parasitic wasps (*Diadromus pulchellus*) were released in 2019 (31 July, 29 Aug), 2021 (18 July), and 2022 (25 Aug). Leek moth traps were moved to a garden containing onions after the garlic was harvested each year.



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2022 PMR REPORT #3

CROP: Rutabaga (*Brassica napus* var. *napobrassica* L.), cv. Laurentian
PESTS: Cabbage maggot (*Delia radicum* L.)

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TITLE: FIELD EVALUATIONS OF INSECTICIDES TO CONTROL CABBAGE MAGGOT IN RUTABAGA, 2022

MATERIALS: CIMEGRA (broflanilide 100 g/L), DELEGATE (spinetoram 25%), EXPERIMENTAL (N/A), MINECTO PRO (abamectin 28.5 g/L, cyantraniliprole 135 g/L), S. CARP + S. FELTIAE (*Steinernema carpocapsae* + *S. feltiae)*, SUCCESS (spinosad 480 g/L), VAYEGO (tetraniliprole 200 g/L), VERIMARK (cyantraniliprole 200 g/L)

METHODS: The field trial was conducted in a commercial field near Exeter, Ontario to evaluate insecticides for cabbage maggot control in rutabagas. Rutabagas were direct seeded at a rate of 6.5 seeds/m (6 inch in-row spacing) on 21 June 2022. The trial was setup in a randomized complete block design (RCBD) with seven replicates and twelve treatments. Each experimental unit consisted of one 30 cm wide row that was 15 m in length. Insecticides were applied on 18 July and treatments included: CIMEGRA – LOW at 0.125 L/ha, CIMEGRA – MEDIUM at 0.25 L/ha, DELEGATE at 0.2 L/ha, SUCCESS at 0.364 L/ha, VAYEGO – Low at 0.3 L/ha, VAYEGO – HIGH at 0.75 L/ha, VERIMARK at 1.35 L/ha, an EXPERIMENTAL – LOW at 0.5 L/ha, EXPERIMENTAL – HIGH at 1.0 L/ha, EXPERIMENTAL + VERIMARK at 0.5 and 1.35 L/ha, respectively. A treatment of entomopathogenic nematode biocontrol S. CARP + S. FELTIAE at a rate of 5 billion/ha was applied at seeding. All treatments were applied as directed banded applications to the soil surface using a hand boom CO_2 sprayer with a TeeJet XR80035 nozzle and a spray volume of 200 L/ha of water. An UNTREATED check was also included. Twenty rutabagas from each plot were hand-harvested on 20 August 2022 and assessed for cabbage maggot damage to the taproot to determine the percent damage. Cabbage maggot damage was rated on a scale developed by Dosdall et al. (1994), where: 0 = no root damage, 1 = small feeding channels on the root comprising less than 10% of the root surface area, 2 = 11-25%, 3 = 26-50%, 4 = 51-75%, and 5 = 76-100% of the taproot surface area damaged. The damage severity index (DSI) was determined using the following equation:

$$DSI = \frac{\sum [(\text{class no.})\ (\text{no. of rutabagas in each class})]}{(\text{total no. of rutabagas per sample})\ (\text{no. of classes - 1})} \times 100$$

According to the rating scale used, rutabagas rated a 0 or 1 were considered marketable and others rated a 2 and higher were considered culls. The monthly air temperature averages were: June 15.4°C, July 19.7°C and August 20.2°C. Monthly rainfall averages were: June 77.4 mm, July 19.7 mm and August 98.4 mm. All data were analyzed using the Randomized Complete Block Design ANOVA in the Analysis of Variance section of Statistix V.10. Means separation was obtained using Tukey's test with $P = 0.05$ level of significance.

RESULTS: Data are presented in Table 1.

CONCLUSION: Numerically, the UNTREATED check had the highest cabbage maggot damage incidence, severity and percent of culls. (Table 1). The CIMEGRA – MEDIUM, EXPERIMENTAL + VERIMARK and S. CARP + S. FELTIAE treatments resulted in the lowest damage incidence and severity, numerically. In addition, the EXPERIMENTAL + VERIMARK treatment did not have any culls at harvest. Cabbage maggot damage throughout the trial was comparatively low, overall.

REFERENCES:

Dosdall, L. M., Herbut, M. J., & Cowle, N. T. (1994). Susceptibilities of species and cultivars of canola and mustard to infestation by root maggots (*Delia* spp.) (Diptera: Anthomyiidae). The Canadian Entomologist, 126(2), 251-260.

Table 1. Percent of cabbage maggot damage, damage severity index (DSI) and percent of culls on rutabagas at harvest after insecticide application, 2022.

Treatment	Cabbage Maggot Damage (%)	DSI[2]	Percent Culls (%)
UNTREATED	21.3 ns[1]	9.4 ns	11.3 ns
SUCCESS	15.0	7.2	8.8
DELEGATE	12.5	3.4	1.3
VERIMARK	10.0	4.1	5.0
CIMEGRA - LOW	10.0	4.4	6.3
CIMEGRA - MEDIUM	5.0	1.9	1.3
VAYEGO - LOW	10.0	4.4	3.8
VAYEGO - HIGH	7.5	2.2	1.3
S. CARP + S. FELTIAE	5.0	1.9	1.3
EXPERIMENTAL - LOW	6.3	2.8	2.5
EXPERIMENTAL - HIGH	7.5	2.2	1.3
EXPERIMENTAL + VERIMARK	5.0	1.3	0.0

[1] ns indicates that no significant differences were found among the treatments at $P = 0.05$.
[2] DSI was calculated using the following equation:

$$DSI = \frac{\sum [(\text{class no.})\ (\text{no. of rutabagas in each class})]}{(\text{total no. of rutabagas per assessed})\ (\text{no. of classes} - 1)} \times 100$$

2022 PMR REPORT #4

CROP: Onion (*Allium cepa* L.)
PEST: Onion Maggot (*Delia antiqua* (L.))

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TITLE: **FIFTH YEAR FIELD DEMONSTRATION OF THE STERILE FLY RELEASE TECHNOLOGY FOR ONION MAGGOT MANAGEMENT IN ONION SET AND COOKING ONION PRODUCTION IN ONTARIO**

MATERIALS: Sterilized/irradiated *Delia antiqua* pupae, onion maggot sticky traps.

METHODS: Four fields near Exeter and Scotland, Ontario, were sown with onions in the spring of 2022. At the Exeter field sites, two adjacent fields with Brady sandy-loam (**Figure 1, A**) and Granby sandy loam (**Figure 1, B**) soils, were seeded at a high density of ~20 million seeds/ha (~8 million seeds/ac) between the 18 and 23 May to produce onion sets. The west field measured approximately 15.1 ha (37.3 ac) and the east field was 9.2 ha (22.7 ac). Both fields had no insecticide treatments at planting or throughout the 2022 growing season and had sterile insect releases in 2022. These two 2022 sterile insect release fields were approximately 1.7 km from fields where sterile flies were release during the 2018, 2019, 2020 and 2021 field seasons (**Figure 1, C–E**). There were no major onion fields within 20 km of these sterile fly release fields.

Another two fields were transplanted with cooking onions near Scotland, Ontario, at an average density of ~345,000 plants/ha (140,000 plants/ac) with no chlorpyrifos applications, but other insecticides were applied (**Table 2)**. These two fields have Caledon sandy-loam soil and are approximately 250m apart. The east field is approximately 4.9 ha (12.0 ac) in size and was planted from 23 April to 5 May (**Figure 2, A**), it is directly adjacent to fields where sterile flies were released in 2019, 2020 and 2021. The west field is approximately 9.8 ha (24.3 ac) in size, was planted from 5 May to 18 May (**Figure 2, B**). Both east and west fields had sterile flies released in 2022 and the field in between these sites (approximately 6.7 ha/16.5 ac in size) had sterile flies released in 2021 (Figure 3, **C**). There were no other major onion fields within a 20 km radius from either of these fields near Scotland.

Onion flies were reared by Phytodata, then sterilized and released using Sterile Insect Technology (SIT) according to Phytodata protocol. The *Delia antiqua* pupae were irradiated by Phytodata using an x-ray irradiator (model RS 1800Q, Rad Source Technologies Inc., GA, USA), dyed pink, shipped to Thedford/Exeter and Scotland, ON, emerged as adult flies, and kept alive until release, following protocols developed by Phytodata Inc (**Figure 3, C**). Fly releases at the Exeter and Scotland sites began the week of 9 May and continued weekly until the week of 7 September. Flies were released after harvest to target the onion maggot population that would overwinter. Flies were released at least 30 m from the closest sticky card trap at all fields. Four onion maggot sticky traps, consisting of three stakes with blue sticky cards clipped above the crop canopy, were placed on the middle of each side of every field (**Figure 3, B**). Cards were monitored weekly for natural onion maggot populations and sterile/pink flies displacement throughout the growing season. In the fields producing onion sets in Exeter, damage plots (15 cm x 15 cm) capturing ~25 plants were set up a short distance away from the sticky traps at the flag leaf stage (**Figure 3, A**). At the Scotland fields, damage plots were created by counting out 25 plants on four rows for a total of 100 plants/plot. Damage plots were counted weekly until harvest at all field sites. The onions were harvested the week of 30 August at the Exeter fields, and from mid August to late September at the Scotland fields (**Tables 1, 3**).

RESULTS: As outlined in Tables 1–4 and in Figures 1–5.

CONCLUSION: Historically, onion maggot (*Delia antiqua*) management has relied heavily on group 1B organophosphates, specifically chlorpyrifos insecticides, which are now no longer a registered use pattern for onions in Canada. Sterile Insect Technology (SIT) in Québec has shown that the release rates of sterile flies could be decreased by up to 90% within 5 years of repeated use due to the reduction of wild populations, decreasing the cost of sterile fly programs over time. Likewise, based on previous monitoring and releases, this work demonstrates the decline of wild fly populations and offers an effective tool to manage onion maggot without chlorpyrifos.

At the Exeter field site, sticky card counts of wild flies indicated a decrease in the average number of wild flies during the population peaks compared to the last four years of onion production in the area, despite fields being 2 km or less to the previous year's sterile insect release fields (**Figure 4**). An average of 3.2 and 2.2 flies/trap/week were counted during the main peak on 5 July (**Table 1; Figure 5**). At the Exeter field site, no plants were found during the duration of the season that showed onion maggot damage. This was the first year where all fields of onion sets were grown without the use of any insecticides. Despite growing onions in fields adjacent to each other or only implementing a single year without onion, populations of wild flies did not increase to levels high enough to cause observable damage at the Exeter field sites (**Figure 5; Table 1**). These results seem to indicate that wild onion maggot levels remained low as a result of sterile fly releases even with continuing cropping of onion sets in the same area for five years, no clothianidin/imidacloprid seed treatment used, no chlorpyrifos drench at planting, and no foliar insecticides applied throughout the growing season (**Table 2**).

At the Scotland field sites, a peak of 3.0 wild flies/trap/week was observed 29 June at the east release field and a peak of 2.2 wild flies/trap/week at the south release field (**Table 3; Figure 5**). Fly counts remained low relative throughout the duration of the season compared to the previous four years of monitoring in the area and to these peaks after 23 June (**Figure 5**). Onion maggot larvae were found and identified throughout the season at the Scotland location, however these wilted plants containing larvae were not in the damage plots (**Table 3**). Both field sites in Scotland were closely planted to onion fields grown in 2019 (<3 km apart) that had no sterilized flies released (**Figure 3, J**). These control fields may have acted as a refuge for wild flies that led to high wild fly counts in 2020.

Throughout the 2022 field season, sticky cards were typically replaced on Tuesday at the field sites near Exeter and Wednesday at the field sites near Scotland, while the sterile flies were released on Sunday/Monday. If the sticky cards were changed more frequently, a more accurate number of wild and sterile flies may have been recorded. A continuation of this release and survey should demonstrate the long-term effects of these sterile fly releases on the wild onion maggot population, and, in turn, show that onion maggot can be controlled through sterile fly releases without the use of chlorpyrifos.

ACKNOWLEDGEMENTS: Funding for this project for the first three years was provided by Pesticide Risk Reduction Program through the Pest Management Centre. Thank you to Brittney Littlefield, Joseph Roy, Hannah Fraser, Dennis Van Dyk and Josh Mosiondz for their help throughout the growing season.

Table 1. Sterile fly release dates, plant stage, weekly average trap counts and damage plot fly population levels at the Exeter release field sites.

	West Release Field – Exeter ~15.1 ha					**East Release Field – Exeter ~9.2 ha**				
Date	Release Quantity ('000)	Plant Stage[1]	Wild Flies	Pink Flies	Damage Plots	Plant Stage[1]	Release Quantity ('000)	Wild Flies	Pink Flies	Damage Plots
22/05/10	25	--	--	--	--	--	15	--	--	--
22/05/17	47	--	--	--	--	--	29	--	--	--
22/05/24	62	pre	0.5	1.2	--	pre	38	0.8	0.0	--
22/05/31	814	pre	0.7	1.6	--	pre	49	1.1	0.0	--
22/06/07	115	loop	1.8	0.2	--	loop	71	1.8	0.0	--
22/06/14	128	2LS	2.3	0.1	20.5	2LS	78	1.1	0.0	25.8
22/06/21	128	3LS	0.3	0.0	20.3	3LS	78	0.6	0.0	25.5
22/06/28	109	3LS	0.7	0.0	21.0	3LS	67	1.3	0.0	26.0
22/07/05	109	4LS	2.2	0.0	20.8	4LS	67	3.2	0.0	25.5
22/07/12	78	5LS	1.0	0.0	18.3	5LS	47	0.6	0.0	25.5
22/07/19	40	6LS	0.5	0.0	18.0	6LS	24	0.3	0.0	24.5
22/07/26	32	6LS	1.2	0.0	18.0	6LS	20	1.2	0.0	24.3
22/08/02	44	6LS	2.1	0.0	18.3	6LS	27	1.3	0.0	24.3
22/08/09	42	7LS	0.8	0.0	18.3	7LS	26	0.8	0.0	23.5
22/08/16	29	wind	1.7	0.0	18.3	7LS	17	0.8	0.0	23.3
22/08/23	24	wind	1.9	0.0	--	7LS	14	1.3	0.0	--
22/08/30	30	post	0.7	0.0	--	wind	18	0.1	0.3	--
22/09/07	25	post	--	--	--	post	16	--	--	--

[1] Plant stage where pre = pre-emergence, loop = loop stage, flag = flag leaf stage, LS = leaf stage and post = after pulling/harvest and -- = data points not taken

Table 2. Insecticide applications from seeding to harvest at the Scotland field sites. No insecticides were applied at the Exeter field sites during the 2022 season.

Date	Field	Trade Name	Common Name	Rate / Hectare
22/06/08	All	Agri-Mek SC	Abamectin	270 mL
22/06/15	All	Agri-Mek SC	Abamectin	270 mL
22/06/29	All	Movento 240 SC	Spirotetramat	365 mL
22/07/02	All	Movento 240 SC	Spirotetramat	365 mL
22/07/13	All	Dibrom	Naled	530 mL
22/07/26	All	Delegate WG	Spinetoram	336 g
22/07/31	All	Delegate WG	Spinetoram	336 g

Table 3. Sterile fly release dates, plant stage, trap counts and damage plot levels at the two release field sites near Scotland, ON.

	Release Field 1 – East ~4.9 ha					Release Field 2 – West ~9.8 ha				
Date	Release Quantity ('000)	Plant Stage[1]	Wild Flies	Pink Flies	Damage Plots	Release Quantity ('000)	Plant Stage [1]	Wild Flies	Pink Flies	Damage Plots
22/05/11	15	--	--	--	--	18	--	--	--	--
22/05/18	27	3LS	0.3	0.0	99.3	34	3LS	0.2	0.3	97.0
22/05/25	36	4LS	0.5	0.1	96.8	46	3LS	0.0	0.0	98.5
22/06/02	47	4LS	1.8	1.0	96.8	58	3LS	1.8	0.8	98.5
22/06/08	65	5LS	2.4	1.1	96.8	80	4LS	1.2	0.2	98.3
22/06/16	74	6LS	1.6	0.1	95.8	93	6LS	1.3	0.0	97.0
22/06/23	74	8LS	1.3	0.0	96.3	92	7LS	1.4	0.0	96.3
22/06/29	63	8LS	3.0	0.0	98.3	78	7LS	2.2	0.0	96.0
22/07/06	67	9LS	0.9	0.0	97.5	80	7LS	1.3	0.0	94.5
22/07/13	70	10LS	2.8	0.8	97.0	80	7LS	0.4	0.0	93.0
22/07/20	35	10LS	1.2	0.0	96.5	40	8LS	1.8	0.0	91.5
22/07/27	19	11LS	1.3	0.0	95.3	23	8LS	0.5	0.0	91.0
22/08/03	25	12LS	0.7	0.0	94.5	32	9LS	0.3	0.0	89.0
22/08/10	24	12LS	0.5	0.0	--	30	12LS	0.1	0.0	86.5
22/08/17	16	wind	1.7	0.0	--	20	12LS	3.2	0.0	84.3
22/08/24	14	wind	2.2	0.0	--	17	wind	0.8	0.0	83.5
22/09/01	17	Post	1.0	0.0	--	21	post	1.0	0.0	--
22/09/08	15	post	--	--	--	18	post	--	--	--

[1] Plant stage where LS = leaf stage, wind = windrowed, and post = harvest and -- = data points not taken

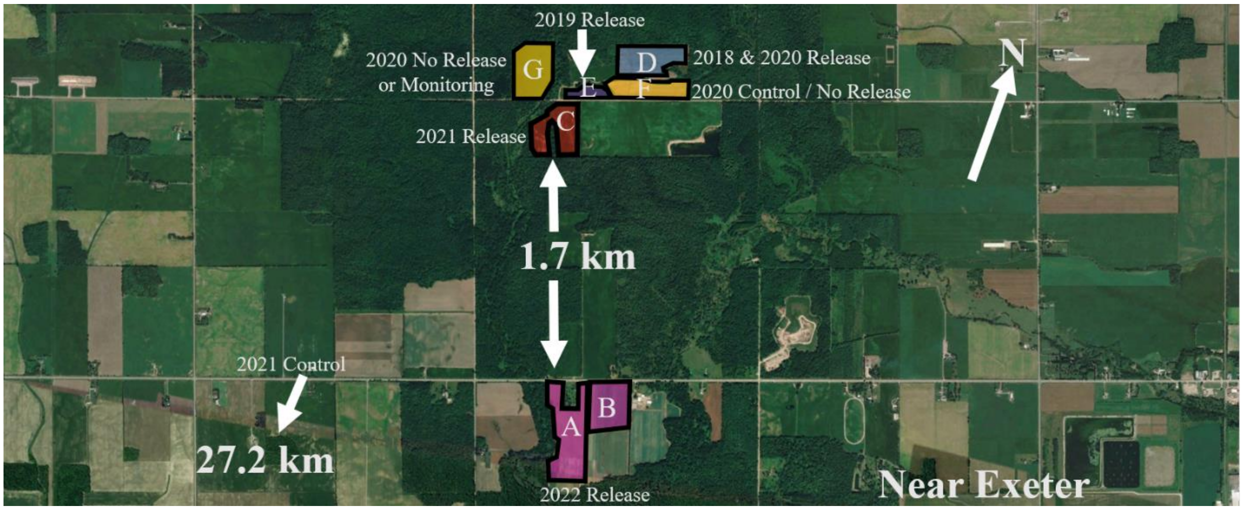

Figure 1. The Exeter release field sites approximately 15.1 ha (37.3 ac) (**A**) and 9.2 ha (22.7 ac) (**B**) were seeded approximately 1.7 km from the field where sterile flies were released during the 2021 field season measuring approximately 9.7 ha (24.0 ac) (**C**). Sterile flies were released during the 2020 and 2018 field season in a field measuring approximately 10.8 ha (26.6 ac) (**D**) as well as a field measuring 3.2 ha (8.0 ac) in 2019 (**E**). Previous years of this project included control fields where no sterile flies were released in 2020 (**F**), situated between 2018, 2019 and 2020 release sites and approximately 6.0 ha (14.9 ac) in size. An additional onion field approximately 9.7 ha (23.3 ac) in size was seeded in 2020 (**G**) and no monitoring took place, and no sterile flies were released at this field.

Figure 2. Sterile flies were released and monitored at two onion field sites near Scotland. The release field that was transplanted first measured approximately 4.9 ha (12.0 ac) (**A**) was located 250 m east of the later-transplanted release field measuring approximately 9.8 ha (24.3 ac) (**B**). The field between the two 2022 release fields had sterile flies were released in 2021 and was approximately 6.7 ha (16.5 ac) in size (**C**). Flies were also released in 2021 in an onion field 1.4 km south that was 7.0 ha (17.1 ac) in size (**D**). Historically, sterile flies were released in past years in fields surrounding the 2022 release in 2019-2021 (**E-H**). Other fields planted with onions in 2019 and 2020 were located 2.8 km west of the 2022 field sites (**G-H**) and in 2019, one field was left as a control where no flies were released that year (**H**).

Figure 3. Damage plots (**A**), sticky cards (**B**) and sterilized, pink onion maggot flies prior to release (**C**).

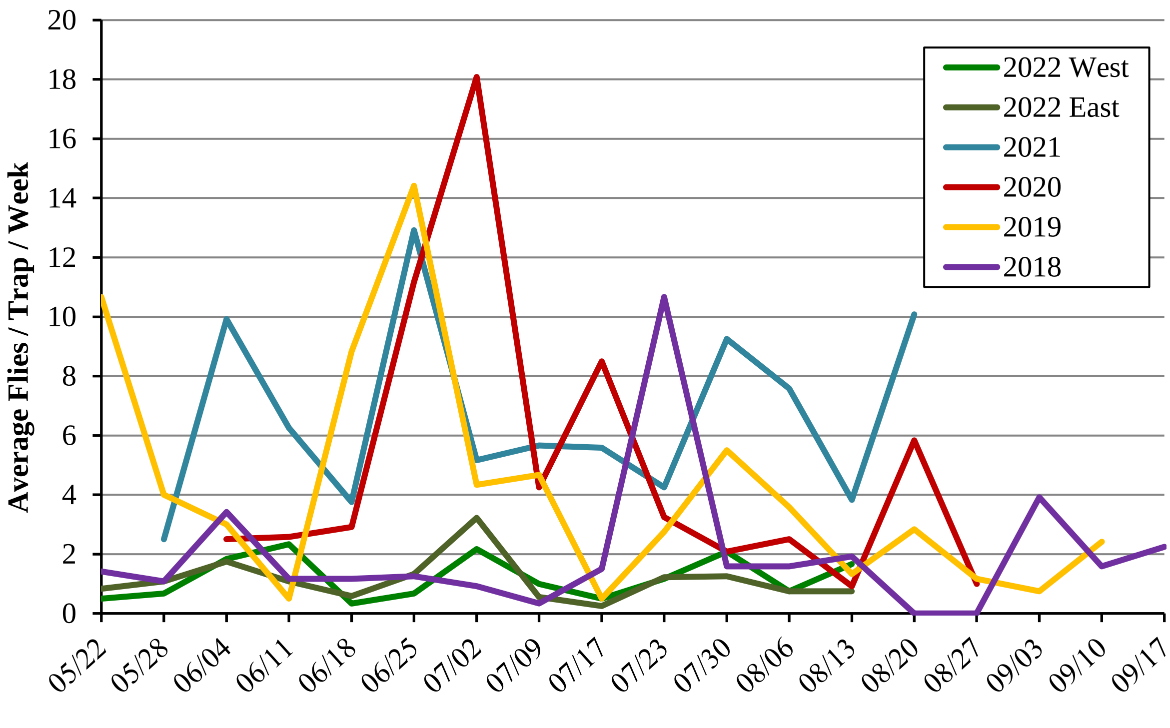

Figure 4. Average wild flies per sticky trap per week at the release field sites near Exeter, ON from 2018 to 2022. All fields shown were within 2 km of each other. Wild/fertile fly counts showed peaks in late June/early July in 2019-2022 while the first peak was identified in late July in 2018 (**purple**).

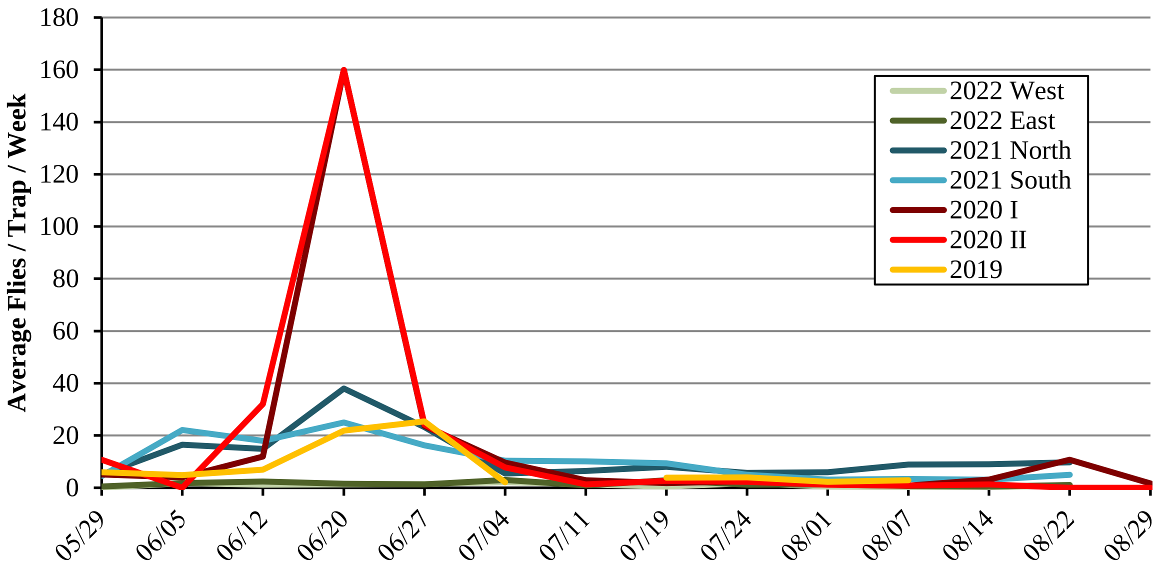

Figure 5. Average wild flies per sticky trap per week at the field sites near Scotland. Wild/fertile fly counts at the release fields in 2022 (**dark and light green**) peaked at 2.1 and 2.8 flies/trap/week. In 2021, the wild fly counts reached peaks of 38.0 and 25.0 flies/trap/week and in 2020, the wild fly counts at two release fields (**dark and light red**) peaked the week of 20 June and filled the sticky cards at an average of 160 flies/card. The release field in 2019 peaked at 25.4 flies/trap/week (**yellow**). Both 2022 fields were adjacent of a field planted with onions in 2021.

2022 PMR REPORT #5

CROP: Garlic (*Allium sativum* L.), cv. Music
PEST: Stem and bulb nematode (*Ditylenchus dipsaci*) (Kühn, 1857) Filip'ev, 1936

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TITLE: EVALUATION OF NEMATICIDES FOR CONTROL OF STEM AND BULB NEMATODE IN GARLIC, 2021-2022

MATERIALS: PROMAX (thyme oil 3.5%), REKLEMEL (fluazaindolizine 500 g/L), VELUM PRIME (fluopyram 500g/L)

METHODS: The field trial was conducted in a mineral soil field (organic matter 3.1%, pH 7.4) free of stem and bulb nematode (SBN) near Cookstown, Ontario. A randomized complete block design with five (5) replicates per treatment was used. Garlic cloves (seed) used were infested with 4 SBN/g clove. Nematode counts were determined at the University of Guelph Ontario Crops Research Centre - Bradford using the Baermann pan method. The treatments were: PROMAX, REKLEMEL and VELUM PRIME applied as a soak (S) or drench (D). Seed soak treatments, and the associated soaking times, were: PROMAX S at 37.4 mL/L for 4-hours, REKLEMEL S at 14.9 mL/L for 4-hours and VELUM PRIME S at 1.7 mL/L for 1- or 2-hours. Soak treatments were applied by placing cloves in a mesh bag in 10 L of each treatment solution for each respective time period. Garlic were air dried following the soaking treatment. The drench treatments were REKLEMEL D at 4.48 L/ha and VELUM PRIME D at 500 mL/ha using a water volume rate of 1000 L/ha. Drench treatments were applied directly over the cloves at planting at an application rate of 90 mL/m using a beaker. An untreated check was also included. Each experimental unit consisted of 25 garlic cloves planted ~5 cm deep and 10 cm apart in 2.5 m long single rows spaced 40 cm apart. The trial was planted on 9 November 2021. Emergence was recorded on 9 May and plant heights were recorded on 9 and 24 May 2022. Garlic was harvested on 4 August. Bulbs were counted, weighed, assessed for basal plate rot and sorted into classes using a 0-4 rating scale, where: 0 = no damage, 1 = 1-24% basal plate missing; 2 = 25-50% basal plate missing; 3 = > 50% basal plate missing and 4 = completely desiccated bulb. These data were used to calculate a disease severity index (DSI) using the formula below.

$$\text{DSI} = \frac{\sum [(\text{class no.})\ (\text{no. of garlic bulbs in each class})]}{(\text{Total no. of garlic bulbs assessed})\ (\text{no. classes -1})} \times 100$$

Stem and bulb nematodes were extracted and quantified from a 10 g sample of cloves after harvest using the Baermann pan method.
Compared to the previous 10-year average, air temperatures in 2022 were above average for May (15.1°C), average for June (18.3°C) August (20.6°C) and September (16.5°C), and below average for July (20.2°C). The 10-year average temperatures were: May 13.7°C, June 18.9°C, July 21.4°C and August 20.4°C. Average temperatures in fall 2021 were: November 2.6°C and December -0.3°C.
Monthly rainfall was below the 10-year average for May (50 mm) and September (43 mm) and average for June (90 mm), July (74 mm) and August (82 mm). The 10-year rainfall averages were: May 64 mm, June 97 mm, July 78 mm and August 79 mm. Average precipitation in fall 2021 were: November 1.4 mm and December 1.5 mm.
Data were analyzed using the General Analysis of Variance function of the Linear Analysis section of Statistix V.10. Means separation was obtained using Tukey's HSD test with *P* = 0.05 level of significance.

RESULTS: Data are presented in Tables 1 and 2

CONCLUSIONS: All three VELUM PRIME treatments significantly reduced stem and bulb nematode damage and increased marketable yield compared to the other treatments (Table 2). The 1-hour soak with VELUM PRIME was as effective as the 2-hour soak for disease severity (8.0 and 4.1%) and percent marketable yield (88.7 and 96.1%), respectively. VELUM PRIME was very effective for management of SBN in garlic as a soak or drench. The organic product PROMAX did not protect garlic from SBN damage. The REKLEMEL soak treatment had the highest disease severity and lowest marketable yield. In addition, the REKLEMEL soak treatment had the lowest emergence and shortest garlic on 24 May 2022 (Table 1). The low counts of SBN in the REKLEMEL soak treatment at harvest may be the result of the nematodes leaving the dead, completely desiccated bulbs before harvest (Table 2).

ACKNOWLEDGEMENTS: Funding for this project was provided by the California Garlic and Onion Research Advisory Board and the Fresh Vegetable Growers of Ontario representing the Ontario Garlic Growers Association.

Table 1. Garlic emergence and plant heights on 9 and 24 May after nematicide application for stem and bulb nematode infested seed cloves near Cookstown, Ontario, 2021-2022.

Treatment	App Method[1]	Soak Time (hours)	% Emergence (of 25 plants)	Plant Height (cm)	
				9 May	24 May
Check	-	-	21.2 a[2]	25.5 ns[3]	44.0 ab
VELUM PRIME	S	1	21.0 a	20.5	49.1 a
VELUM PRIME	D	-	21.0 a	19.3	44.9 ab
PROMAX	S	4	20.8 a	21.3	48.0 ab
REKLEMEL	D	-	20.6 a	19.6	42.3 ab
VELUM PRIME	S	2	17.0 ab	18.9	44.4 ab
REKLEMEL	S	4	12.8 b	16.4	39.4 b

[1] Application Method: S = Soak; D = Drench.
[2] Numbers in a column followed by the same letter are not significantly different at *P* = 0.05, Tukey's HSD test.
[3] ns indicates that no significant differences were found among the treatments at *P* = 0.05.

Table 2. Percent marketable bulbs, nematode disease severity index (DSI), marketable yield and nematode counts from harvested garlic treated with various nematicides to control stem and bulb nematode (SBN) near Cookstown, Ontario, 2021-2022.

Treatment	App. Method[1]	Soak Time (hours)	% Marketable Bulbs	DSI[2]	Marketable Yield (g/plot)	Harvest SBN Count (SBN/g clove)
VELUM PRIME	S	2	96.1 a[3]	4.1 a	863.8 a	3.6 ns[4]
VELUM PRIME	S	1	88.7 a	8.0 a	1054.9 a	0.4
VELUM PRIME	D	-	78.5 a	18.8 a	840.2 a	78.8
REKLEMEL	D	-	40.4 b	51.2 b	335.4 b	18.3
Check	-	-	36.8 bc	56.8 bc	268.7 b	13.9
PROMAX	S	4	15.0 bc	79.2 cd	112.0 b	13.9
REKLEMEL	S	4	7.7 c	85.1 d	44.4 b	5.5

[1] Application Method: S = Soak; D = Drench.
[2] DSI was calculated using the following equation:

$$\text{DSI} = \frac{\sum [(\text{class no.})\ (\text{no. of garlic bulbs in each class})]}{(\text{total no. of garlic bulbs assessed})\ (\text{no. classes} - 1)} \times 100$$

[3] Numbers in a column followed by the same letter are not significantly different at *P* = 0.05, Tukey's HSD test.
[4] ns indicates that no significant differences were found among the treatments at *P* = 0.05.

2022 PMR REPORT #6

CROP: Apple (*Malus* x *domestica*), cvs. Cortland and Ginger Gold
PEST: Apple Scab, *Venturia inaequalis*

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TITLE: FIELD EVALUATION OF BURAN FOR THE CONTROL OF APPLE SCAB IN 2022

MATERIALS: Buran (Garlic powder 15%)

METHODS: A research trial was conducted in an orchard located in St-Frédéric (Québec, Canada) to evaluate the effectiveness of Buran (garlic powder, 15%) as a fungicide against apple scab. The orchard site is a young multileader planting of 7-year-old 'Cortland' and 'Ginger Gold' trees on M.106 rootstock. Buran was applied in post-infection at a rate of 1.4% v/v with a non-ionic surfactant (Ag-Surf 0.1%). All treatments were made using a STIHL SR450 gas powered mist blower sprayer calibrated to deliver 500 L/ha. Treatment dates with corresponding phenological stages and timing of application are presented in Table 1. The experimental design consisted of an incomplete randomized block with five repetitions. In each block, 3 trees were left untreated (UTC), and 3 to 9 trees were treated with Buran. The incidence of apple scab was determined by evaluating the number of infected shoots (Cortland and Ginger Gold), infected clusters and infected fruits (Cortland) in each tree. Disease incidence data were analyzed using a logistic regression model in the GLIMMIX procedure of SAS (version 9.4; SAS Institute Inc., Cary, NC). Least square-means were separated using a Tukey-Kramer test (α=0.05).

RESULTS: Results are presented in Table 2.

CONCLUSIONS: Several rain events at risk of causing infection occurred during this season, leading to a total of 13 post-infection treatments (Table 1). On average, treatments were made 400 DH after the beginning of a rain event at risk of causing infection. For all measured parameters, statistically significant differences were observed between treated and untreated trees (Table 2). Shoot scab incidence in Ginger Gold was reduced by 86% with Buran treatments compared to untreated trees and by 80% in Cortland. In Cortland, cluster scab incidence and fruit scab incidence were reduced with Buran compared to untreated by 79% and 99% respectively. Overall, Buran provided a control of apple scab in both cultivars in 2022.

ACKNOWLDEGMENTS: Buran is a non-conventional fungicide product manufactured by AEF Global, and registered in Canada for use in multiple fruit crops, including for scab suppression in apples.

Table 1. Treatment dates, phenological stages, and timing of Buran application.

Treatment date	Phenological stage	Post-infection timing of application ($DH_{0°C}$) [1]
May 16th	Tight cluster-Pink	472
May 18th	Pink	347
May 22nd	Pink-Bloom	350
May 24th	Pink-Bloom	367
May 27th	Bloom	368
May 28th	Bloom-Petal fall	461
June 2nd	Petal fall	356
June 4th	Petal fall	424
June 8th	Fruit set	480
June 10th	Fruit set	428
June 13th	Fruit set	437
June 17th	Fruit set	308
June 19th	Fruit set	408

[1] Degree-hour calculated from the onset of rain with a base temperature of 0°C (Thetford mines weather station of Environment and Climate Change Canada – Meteorological service of Canada)

Table 2. Field evaluation of Buran for apple scab control in 2022.

	Ginger Gold	**Cortland**		
Treatment	Shoot Scab Incidence (%)	Shoot Scab Incidence (%)	Cluster Scab Incidence (%)	Fruit Scab Incidence (%)
Untreated control	98.3 a	85.0 a	57.5 a	35.1 a
Buran 1.4%	13.8 b	16.7 b	11.9 b	0.6 b

In a column, least square-means followed by a different letter are significantly different ($p < 0.01$) according to the Tukey-Kramer Test.

2022 PMR REPORT #7

CROP: Wine Grape (*Vitis vinifera*), cv. Chardonnay
PEST: Botryosphaeria dieback (*Diplodia seriata)*

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TITLE: CROP TOLERANCE TO, AND EFFICACY OF SENATOR 50 SC TO CONTROL GRAPEVINE TRUNK DISEASE ON WINE GRAPE

MATERIALS: SENATOR 50 SC; thiophanate-methyl.

METHODS: The trial was conducted in a Chardonnay vineyard at Agriculture and Agri-Food Canada's Summerland Research & Development Centre in 2022. Vines were planted in 2009 and have been maintained for research purposes as a commercially representative vineyard of the region. Treatments included untreated checks, two treatment rates of SENATOR 50 SC (1764 ml/ha and 2352 ml/ha) and three inoculation timings of the pathogen after pruning (48 hours, 14 days and 21 days). Experimental design consisted of four replicates in a randomized complete block with each treatment plot having two vines per inoculation timing and two buffer plants at the plot ends. On 5 April 2022, all experimental vines were pruned leaving three to four node canes on each spur to ensure the inoculated pathogen will not reach the framework of the vine (cordon) and it is removed when canes are collected. The first application of SENATOR 50 SC was completed across all treatments on 6 April 2022, and the second, if required, on 19 April 2022. All applications were conducted with a shrouded over-the-row recirculating sprayer at a volume of 500 L/ha. Inoculations took place on 7, 20, and 27 April 2022. Each pruning wound was inoculated with 2,000 spores of previously identified Botryosphaeria dieback pathogen *Diplodia seriata* (SuRDC-1089). Two vines in each treatment plot were inoculated within 24 hours after spray application, 14 days after application and 21 days after application. Cane collection occurred 5 weeks after each inoculation date and consisted of ten canes from each assessed vine. Re-isolation was completed by surface sterilizing the inoculated end of each cane and plating onto petri plates containing potato dextrose agar with tetracycline. These plates were incubated at 23°C for seven days then moved to cold storage set at 4^{o}C. The plates were later visually evaluated for the presence or absence of *D. seriata*. Visual estimates of potential phytotoxic effects were done in the field before each collection of canes. Data was entered into ARM software (revision 2022.2) and analyzed using Tukey's HSD (p=0.05) for mean separation.

RESULTS: As outlined in Tables 1, 2 and 3

CONCLUSIONS: No phytotoxic effects were observed in any of the treatments. SENATOR 50 SC applied at a rate of 1764 ml/ha or 2352 ml/ha reduced the incidence of *D. seriata* in the Chardonnay vineyard regardless of the inoculation timing. This reduction was demonstrated with one application of these rates and with two applications at 2352 ml/ha with a 13-day re-treatment interval.

ACKNOWLEDGEMENTS: Thank you to Heather Peill, Douglass Weddell, Julie Boulé, and research assistants Melanie Martens, Ben Miller and Clay Roper-Daniels.

Table 1. Average incidence of *D. seriata* re-isolated from canes sprayed 24 hrs after pruning and inoculated with a spore solution of *D. seriata* 48 hrs after pruning (0 = absence, 1 = presence).

Treatment	Number of Applications	Incidence[1,2] (0 = absence, 1 = presence)
Inoculated Check	0	0.7 a
SENATOR 50 SC @ 1764 ml/ha	1	0.1 b
SENATOR 50 SC @ 2352 ml/ha	1	0.1 b
SENATOR 50SC @ 2352 ml/ha	2	0.0 b

[1] Numbers in a column followed by the same letter are not significantly different at *P* = 0.05, Tukey's HSD.
[2] Column does not meet assumptions of AOV. Exclude treatment 4 from analysis to resolve skewness.

Table 2. Average incidence of *D. seriata* re-isolated from canes sprayed 24 hrs after pruning and inoculated with a spore solution of *D. seriata* 14 days after pruning (0 = absence, 1 = presence).

Treatment	Number of Applications	Incidence[1] (0 = absence, 1 = presence)
Inoculated Check	0	0.5 a
SENATOR 50 SC @ 1764 ml/ha	1	0.1 b
SENATOR 50 SC @ 2352 ml/ha	1	0.0 b

[1] Numbers in a column followed by the same letter are not significantly different at *P* = 0.05, Tukey's HSD.

Table 3. Average incidence of *D. seriata* re-isolated from canes sprayed 24 hrs after pruning and inoculated with a spore solution of *D. seriata* 21 days after pruning (0 = absence, 1 = presence).

Treatment	Number of Applications	Incidence[1] (0 = absence, 1 = presence)
Inoculated Check	0	0.2 a
SENATOR 50 SC @ 1764 ml/ha	1	0.1 b
SENATOR 50 SC @ 2352 ml/ha	1	0.0 b

[1] Numbers in a column followed by the same letter are not significantly different at *P* = 0.05, Tukey's HSD.

2022 PMR Report #8

CROP: Winter wheat (*Triticum aestivum* L.), cv. Several
PEST: Fusarium head blight, *Fusarium graminearum* Schwabe

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TITLE: **EVALUATION OF WINTER WHEAT FOR RESISTANCE TO FUSARIUM HEAD BLIGHT (FHB) IN INOCULATED AND MISTED PLOTS**

METHODS: The winter wheat from the University of Guelph, Ridgetown Campus breeding program and checks were planted in a randomized complete block design in a replicated trial on October 18, 2021 at Ridgetown, Ontario. Included checks had different levels of resistance to Fusarium head blight (FHB). The plots were planted in three replications at 270 seeds/plot, in single rows 2 m long and spaced 17.8 cm apart. Each plot was fertilized and maintained using provincial recommendations and spray inoculated with 100 mL of combined suspension of macroconidia (50,000 spores/mL) of four *Fusarium graminearum* isolates per plot. Plots were misted daily beginning after the first plots were inoculated. The overhead mister was set to run from 11:00-16:00 and misted for approximately 60-90 seconds every 8-10 minutes. The mist system was engaged until three days after the last variety was inoculated with *F. graminearum*. FHB symptoms were recorded as incidence (percent of heads infected) and severity (percent of spikelets infected). FHB severity was estimated according to Stack and McMullen (1995). FHB index for each plot was the product of severity and incidence divided by 100. Heading dates (Julian days-JD) and plant height (cm) were recorded for each plot. All data were analyzed using ANOVA (ARM 8 software). The Student-Newman-Keuls test was used to detect least significant differences (LSD) among the treatments at $P<0.05$. Correlation coefficients were used to determine relationship among the traits.

RESULTS: The results are given in Table 1.

CONCLUSION: Average heading date and plant height were 149.0 and 94.3 cm, respectively. The FHB index ranged from 7.1% to 46.2%. Average FHB severity, incidence, and index were 42.9, 40.2 and 17.3, respectively. The highest FHB index among the checks was Marker wheat, which is rated as a FHB moderately susceptible (MS) wheat by the Ontario Cereal Crop Committee (OCCC). Higher correlation was recorded between FHB index and FHB incidence ($r = 0.76$, $P = 0.0001$) than between FHB index and FHB severity ($r = 0.56$, $P = 0.0001$). Plant height and heading date had negative correlations with FHB incidence ($r = -0.24$, $P<0.05$ and r = --0.34, $P<0.05$, respectively). The most FHB resistant lines were tested for yield and other traits, and will be potentially registered in Eastern Canada and/or used in the future crosses.

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Table 1. Heading date, plant height**,** Fusarium head blight severity, incidence and index, across winter wheat breeding lines and checks, in inoculated and misted plots at Ridgetown, Ontario. 2021-2022.

Line	Heading (JD)	Height (cm)	FHB Severity (%)	FHB Incidence (%)	FHB index (%)
12w931-131	149.3	94.3	54.0	36.7	19.8
12w931-142	150.7	103.0	40.0	30.0	12.7
12W932-229	150.0	91.7	47.7	26.7	10.3
12w933-122	150.7	96.3	54.0	40.0	21.6
13w902-178	150.0	85.3	47.0	36.7	16.3
13w906-97	148.0	89.0	47.0	48.3	25.1
13w908-225	150.3	102.3	77.0	60.0	46.2
13W908-243	150.0	101.0	27.0	31.7	9.3
13w908-254	150.0	93.0	33.0	36.7	12.1
Ca14002-129	147.3	80.3	27.0	68.3	18.1
Ca14002-23	150.7	88.7	54.7	31.7	16.2
Ca14002-96	151.7	95.3	47.7	30.0	11.4
Ca14004-269	148.0	92.7	47.0	60.0	28.9
Ca14004-286	146.3	96.7	40.0	53.3	21.1
Ca14004-296	146.7	96.3	40.0	30.0	10.6
Ca14015-20	149.3	90.7	40.0	43.3	18.5
Ca14015-21	150.3	107.0	27.0	23.3	7.1
Ca14015-8	150.0	94.7	41.7	30.0	11.3
Ca14019-232	150.3	97.0	40.0	33.3	14.5
Ca14019-241	149.0	89.0	33.0	26.7	8.8
25R74 (MR check)	148.7	79.0	27.0	53.3	15.2
CM614 (MS check)	149.3	94.0	33.0	51.7	17.1
Marker (MS check)	149.3	94.0	61.7	43.3	26.5
Mean	149.0	94.3	42.9	40.2	17.3
CV	0.8	3.3	35.0	45.3	54.1
LSD	1.9	5.1	24.8	29.9	15.3