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Of Mice and Men: Managing mice in apple orchards

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Voles

Voles (or mice as they are commonly referred to) can cause significant economic injury in Ontario apple orchards. They are most commonly a problem in orchards when there is a lack of food available. Voles are brown or gray rodents with stocky bodies short legs and a short tail. They are active day and night, year round .

Voles most commonly breed in the spring. Females are capable of reproducing at the age of 3 weeks, and litters of two to nine young are produced monthly. Populations can increase dramatically, followed by a crash. Population levels generally peak every two to five years, however these cycles are not predictable. Voles often feed on grass seeds, herbs and bulbs during the spring and summer and then switch to feeding on bark in the fall and winter. Indications of the presence of voles in orchards appear at harvest when tunnels, droppings and chewed apples begin to appear in fruit. Leaving dropped apples from the trees after harvest can attract rodents into the orchard.

The two species of voles in Ontario are the meadow vole (or meadow mouse) and the pine vole. The most common mouse in orchards is the meadow vole which is about 150 mm to 195 mm in length, dark brown in colour with a gray belly. Its tail is twice as long as its hind foot, the ears are furred and projecting slightly above the fur on its head, and it has prominent eyes. Meadow mice thrive in extensive grassy or weedy areas such as old fields and areas with succulent green plants (orchards, pastures, hay fields and fence rows). They create shallow tunnels in the soil and surface runways in the grass. The pine vole is smaller than the meadow vole, light brown fur and a tail about as long as its hind foot. It has sunken eyes and its ears are buried in fur. The pine vole is present south of the line between Goderich and Ottawa. Pine voles dig deep tunnels but make few surface runways. They require a set amount of organic matter and clay content in the soil so their tunnels can hold up; they are rarely found in sandy locations.

Both types of voles girdle tree trunks in the fall and winter especially in years with heavy and prolonged snow cover. Vole damage can result tree stress or death.

Management Options

Biological

A variety of wild animals such as hawks, owls, crows, ravens, weasels, foxes, coyotes, raccoons, skunks, cats and snakes feed on voles. Predation may not manage high vole populations, but it may help to manage populations in normal years to prevent some damage.

Habitat modification

Reducing or eliminating long grass and cover is a good method of reducing vole populations. Grass should be mowed between 7.5 and 15 cm to limit food and cover and expose the voles to predators. Waiting long intervals between mowing or

mowing with a sickle-bar mower may produce a thatch layer that provides cover for voles. Maintaining a wide herbicide strip in the tree row or under individual trees coupled with regular close mowing of orchard ground cover helps to discourage mice from taking up residence in orchards. Avoid leaving mulch, prunings or decaying vegetation around the base of trees or in tree rows.

Exclusion

Mouse guards can be placed around trees to prevent voles from damaging the bark. Guards should be used on young trees, where small amounts of vole damage can severely damage or kill the tree. Guards should be approximately 45 cm high and should be buried in the soil 5 cm deep. Mouse guards should be checked each year to make sure they are working and to ensure that they are not interfering with trunk expansion. Avoid the use of guards which do not allow air circulation. Always use light coloured tree guards since dark materials can increase the temperature of the bark on sunny days in winter and low temperatures at night can cause injury to bark tissue.

Trapping

While trapping is not effective for controlling high vole populations, it can be used to monitor or control small populations. Mouse traps baited with peanut butter, oatmeal or apples slices can be placed near runways or tunnels.

Repellents

Repellents such as thiram are registered for voles. However there is some uncertainty about the long term efficacy of these products.

Rodenticides

Poison baits can be used to help manage mouse populations. Baits are more effective if other food sources (dropped apples) are picked up and removed from the orchard. Baits should be applied before the ground is covered with snow and the grass falls over. Baits should be applied on bright days with no rain expected for several days. Baits are poisonous to many non-target organisms (cats, dogs, turkeys, pheasants, raccoons and skunks.)

Bait stations are often a better way of managing mice because they provide long-term control of pest populations. They are also considered to be more environmentally friendly because they minimize the risk of other animals, and or children coming in contact with the poison. Slabs of wood, pieces of board or tin cans with one end removed can be used for bait stations. Bait is placed under the board or in the can with the can lying on its side. The inverted T bait station is made of 3.8 cm ABS pipe and is probably the most effective type of bait station available. In this station several table spoons of bait are placed in the neck which is capped protecting the bait from the elements. Use 25 stations per ha (10 per acre). Recently a reduced-risk biopesticide Rode-trol Rodent Control Bait was registered for rats/mice control for use in buildings, warehouses, barns and empty feed storage areas.

Millipedes attacking sweet potatoes and carrots in Ontario – the latest info

Part 1: Tracking millipede populations in the field

Melanie Filotas, Specialty Crops IPM Specialist and Jennifer Allen, Vegetable Crops Specialist

Millipedes are considered beneficial in vegetable production due to their habit of feeding on decaying plant material, which helps to incorporate organic matter into the soil. However, under certain conditions millipede populations can build to high levels and may damage the roots and seedlings of a variety of crops. In recent years, millipedes have become an increasing problem in a number of Ontario crops, including no/low-till field corn and ginseng.

In a recent Hort Matters article, we noted that over the last few years there have been numerous incidents where large numbers of millipedes were found in root vegetables where crop damage had been attributed to wireworms. At the time, we did not have enough information to know whether millipedes were emerging as a new pest of root vegetables in Ontario, or whether they were simply secondary feeders entering these crops after being damaged by other pests. In the summer of 2007 a research project was conducted by University of Guelph researchers and OMAFRA staff to address the role of millipedes as potential pests of Ontario root crops.

Field Sampling: Sampling was conducted throughout the 2007 growing season in three sweet potato and three carrot fields in southwestern Ontario. The purpose of this research was to observe changes in millipede numbers throughout the season, determine where in the field they were located, and compare different monitoring methods. Three trap types were buried in the soil at 30 sites per field: (1) potato bait (a piece of white potato placed in a fine mesh bag), (2) corn bait (Fig. 1, a quarter cup of untreated corn placed in a fine mesh bag, then soaked in water for 12 hrs) and (3) a pitfall trap (Fig. 2, a plastic cup partially filled with antifreeze). The traps were left in the ground for one week, then the number and species of millipedes was recorded. Fields were visited every other week, from shortly after planting (May for carrots, June for sweet potatoes) until early September. At the end of the season, sweet potatoes and carrots were harvested from each sample site, and assessed for pest damage.

What we saw:

- Millipede populations varied considerably among fields for both carrots and sweet potatoes (Figs. 3 and 4). This was likely due to differences in soil moisture, soil organic matter and texture and crop production practices, but more study is needed to determine exactly what conditions contribute to high populations.
- In carrot fields, millipede populations were highest early in the season, dropping down to very low numbers during the hot dry periods of June to August, 2007 (Fig 3). In contrast, millipede populations were higher in sweet potato fields, and tended to remain high throughout the season (Fig 4). In one sweet potato field, we found more than 2000 millipedes even after a prolonged period of high heat and little rain! What accounts for this difference? It may be due to

the fact that, once sweet potato vines close over, the field is essentially covered by a dense crop canopy that helps to keep soil moist. Additionally, sweet potato weeds are commonly left on the soil after hand hoeing, which may create localized areas of cool, moist conditions that favour millipedes. Carrots, on the other hand, do not form such a dense canopy, and the carrot fields in this study were more severely impacted by the limited rainfall of 2007.

- Millipede populations also varied within the field. We tended to find more millipedes in traps placed closer to the centre of the field than in traps located adjacent to the field edge.
- In both carrot and sweet potato fields, we found that pitfall traps were better at collecting millipedes earlier in the season. Later in the season, after crop canopies filled in, corn bait traps became more efficient at trapping millipedes (Figs. 5 and 6).
- End of season crop damage varied from 0 to 57% of sweet potatoes sampled. Damage to carrots ranged from 0 to 30%, but was generally much lower than that seen in sweet potato fields. However, we cannot directly relate end-of-season damage with millipede populations because feeding occurs strictly underground, and may have been partly due to other soil pests. To address this problem, we conducted laboratory studies to observe the type of damage caused by millipedes over time. These results will be reported in a subsequent article.

So in a nutshell, millipedes definitely can be present in large numbers in root vegetable fields, with populations tending to be higher in the middle of the field. In contrast to what we previously believed, the environment does not need to be extremely wet to favour development of high millipede populations. In fact, a closed crop canopy and developing crops may actually favour millipedes in dry conditions because they act as sources of moisture. We were also able to identify sampling techniques that were effective at detecting millipedes in the field. In part 2 of this article, we will report results of lab studies designed to identify millipedes and study the damage they do to root crops.

See the next issue of Hort Matters for Part 2: Identifying pest millipedes and the damage they do.

Acknowledgements

The authors wish to thank the Canada-Ontario Research and Development Program (CORD), an initiative of the federal-provincial territorial Agricultural Policy Framework and the Fresh Vegetable Growers of Ontario for funding. Thanks also go to Drs. Sears and Hallett, L. O'Keefe and T. Marrowa of the University of Guelph. A special thank you to all cooperating sweet potato and carrot growers who collaborated on this project.

Figure 1 – Example of a corn bait trap.



Figure 2 – Example of a pitfall trap, covered with a canopy (plastic dairy container lid and galvanized wire) to protect it from rain.

Sweet potatoes

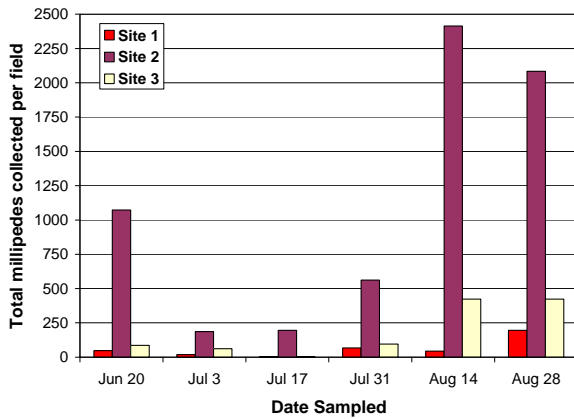


Figure 4. Total number of millipedes captured per sweet potato field (all trap types) from June to September, 2007.

Carrots

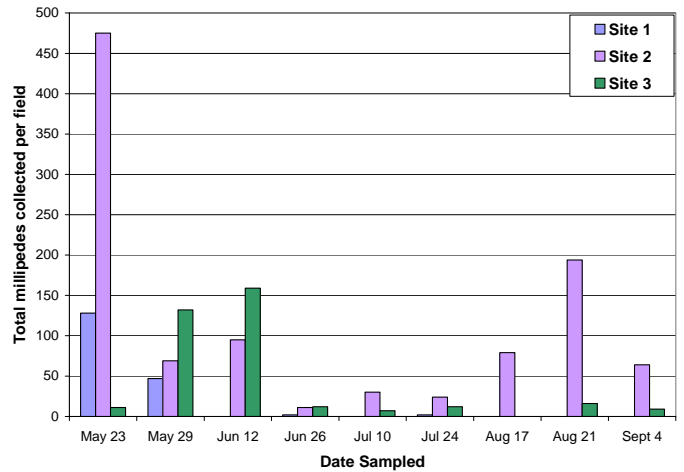


Figure 5. Total number of millipedes captured per carrot field (all trap types) from May to September, 2007

Sweet Potatoes

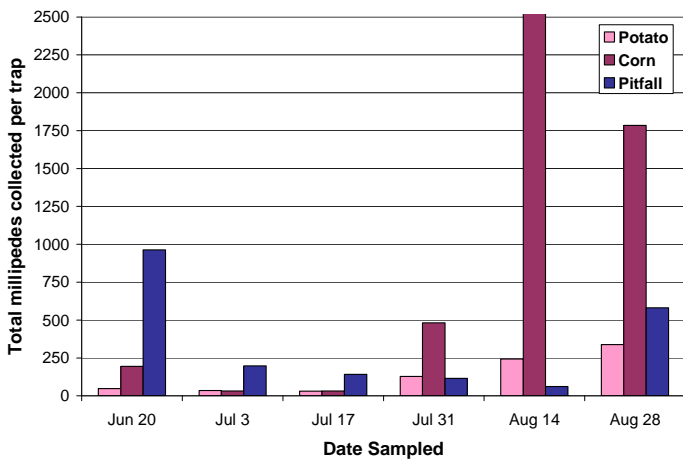


Figure 6. Total number of millipedes captured per trap type in sweet potato fields from June to September, 2007

Carrots

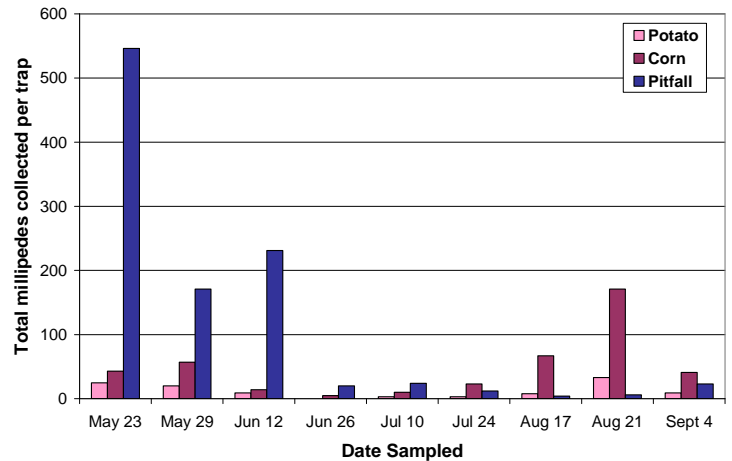


Figure 7. Total number of millipedes captured per trap type in carrot fields from May to September, 2007

Minor Use Label Expansion Granted For Bravo 500 Fungicide For Powdery Mildew On Field Cucurbits

The Pest Management Regulatory Agency (PMRA) recently announced the approval of a minor use label expansion for **BRAVO 500 FUNGICIDE** for control of POWDERY MILDEW on field cucurbits, crop group 9 (which includes cucumbers, melons, squash, pumpkins and all other field cucurbits) in Canada. BRAVO 500 FUNGICIDE was already labeled for management of a number of other diseases on cucurbits and many other specialty crops in Canada; however powdery mildew was only registered on a few of the crops in the crop group. This new minor use expands the Bravo 500 fungicide label to include the entire crop group for control of powdery mildew.

This will provide field cucurbit growers with an important disease management tool to manage one of the most common cucurbit disease problems. Although **downy mildew** on field cucurbits has been the subject of several recent registrations in Canada, growers also have to tackle management of **powdery mildew**. Both diseases can cause serious losses in both quality and yield.

Bravo 500 Fungicide can be applied as a foliar spray on a 7 day schedule beginning at the 1st true leaf stage or when disease conditions are favourable at a rate of 4.8 L per hectare in sufficient water to obtain adequate coverage. Bravo 500 Fungicide can be applied up to 7 times per season, however after each application of Bravo, be sure to alternate with at least one application of fungicide having a different mode of action for control of powdery mildew. **The preharvest interval is 1 day.**

Bravo 500 fungicide should be used in an integrated pest management program and in rotation with other management strategies. Follow all other precautions and directions for use on the Bravo 500 fungicide label.

This minor use label expansion was sponsored by the Quebec Horticultural Council in response to minor use priorities established by field cucurbit producers, processors, extension personnel and researchers in several provinces.

Furthermore, we also wish to thank the personnel of **Syngenta Crop Protection Canada Inc.** for their support of this registration and the personnel of the Pest Management Regulatory Agency for evaluating and approving this important pest management tool.

For copies of the new minor use label contact Jim Chaput, OMAFRA, Guelph (519) 826-3539, Elaine Roddy, OMAFRA, Ridgetown (519) 674-1616 or visit www.syngenta.ca

Minor Use Label Expansion Granted For Frontier Herbicide For Control Of Weeds On Peanuts

The Pest Management Regulatory Agency (PMRA) recently announced the approval of a minor use label expansion for **FRONTIER** herbicide (dimethenamid) for control of labeled weeds on peanuts in Ontario. Frontier herbicide was already labeled for use on corn, soybeans, dry beans, dry onions, grapes and transplanted cabbage. This is one of the first minor use label expansions for peanuts in Canada in over 15 years.

This minor use submission was sponsored by minor use office of OMAFRA in the fall of 2006 in response to minor use priorities identified by Ontario peanut producers and extension personnel.

Weed management has been a high priority for peanut producers and the registration of Frontier herbicide will provide peanut producers with an effective and useful weed management tool.

Frontier herbicide can be applied at a rate of 1.1 – 1.25 L product per ha either as a pre-plant incorporated (1.25 L) treatment or as a pre-emergent to the crop treatment (1.1 – 1.25 L) in a water volume that ensures thorough coverage as per the current label directions. The pre-harvest interval for peanuts is 80 days. Peanuts should be seeded at least 4 cm deep or crop injury may occur and do not apply Frontier herbicide if peanuts have emerged.

Frontier herbicide should be used in an integrated weed management program and in rotation with other management strategies. Follow all other precautions and directions for use on the Frontier herbicide label.

This minor use submission was sponsored by the provincial minor use office of OMAFRA as a result of priorities established in consultation with producers. We also wish to thank the personnel of **BASF Canada Inc.** for their support of this registration and the personnel of the Pest Management Regulatory Agency for evaluating and approving this important pest management tool.

For copies of the new minor use label contact Leslie Huffman, OMAFRA, Harrow (519) 738-1256, Jim Chaput, OMAFRA, Guelph (519) 826-3539 or visit <http://www.agsolutions.ca>

Endeavor 50 WG insecticide: Now registered in Canada for Balsam twig aphid control on Xmas trees

The Pest Management Regulatory Agency (PMRA) recently announced the approval of a minor use label expansion for **Endeavor 50 WG (pymetrozine)** insecticide for control of **Balsam twig aphid** (*Mindarus abietinus*) on xmas trees in Canada. Endeavor 50WG insecticide was already labeled in Canada for control of aphids on greenhouse and outdoor ornamentals and greenhouse tomatoes and peppers.

This minor use registration addresses a key pest priority of the Canadian xmas tree industry.

The addition of Endeavor 50WG insecticide contributes significantly to the IPM toolkit available to Canadian xmas tree producers.

Endeavor 50WG can be applied at a rate of 193 g product per hectare in a spray volume of 275 litres per hectare. Apply in the spring when the first generation of aphids appears. Do not use more than 2 applications per crop season. Allow at least 7 days between applications. The use of a non-ionic surfactant (Agral 90, Ag Surf, LI 700, Sylgard 309) is recommended to improve the performance of Endeavor 50WG under drought stress conditions. Consult the Endeavor and surfactant labels carefully for use directions.

Endeavor 50WG should be used in an IPM program and in rotation with other management strategies. Follow all other precautions and directions for use on the Endeavor label.

This minor use submission was sponsored by the Quebec Ministry of Agriculture, Fisheries and Food (MAPAQ) in the spring of 2007. We wish to thank the personnel of **Syngenta Crop Protection Canada Inc.** for their support of this registration and the personnel of the Pest Management Regulatory Agency for evaluating and approving this important pest management tool.

For copies of the new supplemental labels contact Jim Chaput, OMAFRA, Guelph (519) 826-3539, Jennifer Llewellyn, OMAFRA, Guelph (519) 824-4120 ext. 52671 or visit Syngenta Crop Protection Canada Inc. at www.syngenta.ca

Minor Use Label Expansion Granted For Intrepid 240f Insecticide For Control Of Leafrollers On Pome Fruit

The Pest Management Regulatory Agency (PMRA) recently announced the approval of a minor use label expansion for **INTREPID 240F** insecticide (methoxyfenozide) for control of oblique banded leafroller (OBLR) and three-lined leafroller (TLLR) on pome fruit (apples, pears, crabapples, Oriental pears, quinces) in Canada. Intrepid 240F was already labeled for management of Lepidopteran pests of apples in Canada. This is the 1st label expansion for Intrepid 240F insecticide in Canada.

This minor use submission was sponsored by Agriculture and Agri-Food Canada, Pest Management Centre (AAFC-PMC) in the fall of 2006 in response to minor use priorities identified by Canadian pome fruit producers and extension personnel.

Access to new insect management tools is a high priority for pome fruit producers and the label expansion of Intrepid insecticide will provide pome fruit producers with an effective and useful leafroller management tool.

Intrepid 240F insecticide can be applied at a rate of 750 mL product per ha in a minimum spray volume of 1000 L per ha to a maximum of two times per season. For control of the overwintering generation apply Intrepid during late bloom to early petal fall when larvae are actively feeding and before they roll up in the actively growing terminals. For suppression of the summer generation apply Intrepid at 1st egg hatch (as determined by degree days). A second application can be made at 10-14 days after if monitoring indicates a need. Field monitoring and degree data for leafrollers is needed to time these applications accurately. A maximum of 2 applications per season is permitted. The pre-harvest interval for pome fruit is 14 days.

Intrepid 240F insecticide should be used in an integrated pest management program and in rotation with other management strategies. Follow all other precautions and directions for use on the Intrepid 240F insecticide label.

This minor use submission was sponsored by AAFC-PMC as a result of priorities established in consultation with producers. We also wish to thank the personnel of **Dow Agrosciences Canada Inc.** for their support of this registration and the personnel of the Pest Management Regulatory Agency for evaluating and approving this important pest management tool.

For copies of the new minor use label contact Kathryn Carter, OMAFRA, Simcoe (519) 426-4322, Jim Chaput, OMAFRA, Guelph (519) 826-3539 or visit <http://www.dowagro.com/ca/en/index.htm>

KANEMITE 15SC and SHUTTLE 15SC miticides Granted 1st Canadian Registration for control of mites on pome fruit, field grown ornamentals and greenhouse and shadehouse container-grown ornamentals

Arysta LifeScience North America and the Pest Management Regulatory Agency (PMRA) recently announced the registrations of **Kanemite and Shuttle** (acequinocyl) miticides for control of several important mite pests on pome fruit (apples, pears), field grown outdoor ornamentals and greenhouse and shadehouse, container-grown ornamentals in Canada. This is the 1st registration of these products in Canada and marks an important milestone in addressing the pest management technology gap.

Kanemite 15 SC and Shuttle 15SC miticides offer growers a new and novel mode of action to control several important mites of pome fruit and ornamentals. Because of serious resistance concerns, the registration of these new miticides is critical to developing a robust and effective resistance management strategy.

The following table provides a summary of the crop and pest registrations on the new Canadian **Kanemite** miticide label:

Crop(s)	Pest(s)	Product Rate	Comments
Apples, pears	Two-spotted mite European red mite	2.1 L per hectare applied in appropriate water volume to achieve thorough coverage of all plant surfaces.	2 applications per year are permitted. Allow a minimum of 21 days between applications of Kanemite. The pre-harvest interval is 14 days.
Field grown ornamentals (except roses)	Two spotted mite Spruce spider mite	0.21 – 0.46 L product per 500 L of water	Apply as a full coverage spray to the foliage to drip. 2 applications per year are permitted. Do not apply to impatiens.
Field roses	Two spotted mite	0.21 L product per 500 L of water	Do not apply to miniature roses

The following table provides a summary of the crop and pest registrations on the new Canadian **Shuttle** miticide label:

Crop(s)	Pest(s)	Product Rate	Comments
Greenhouse and shadehouse ornamentals (except roses)	Two spotted mite Spruce spider mite	0.21 – 0.46 L product per 500 L of water	Apply as a full coverage spray to the foliage to drip. Do not apply to impatiens. Do not apply more than 2 applications per year.
Greenhouse and shadehouse roses	Two spotted mite	0.21 L product per 500 L of water	Do not apply to miniature roses. Do not apply more than 2 applications per year.

Follow all other directions for use on the Kanemite and Shuttle miticide labels carefully.

Kanemite and Shuttle miticides should be used in an Integrated Pest Management program and in rotation with other management strategies to adequately manage resistance. Consult provincial guidelines and local extension specialists for monitoring protocols and treatment thresholds.

We wish to thank the personnel of **Arysta LifeScience North America Corp.** for their support of this registration and the personnel of the Pest Management Regulatory Agency for evaluating and approving this new pest management tool.

For copies of the new Kanemite 15SC label contact Jim Chaput, OMAFRA, Guelph (519) 826-3539, Jennifer Llewellyn (**Field Ornamentals**), OMAFRA, Guelph (519) 824-4120 ext. 52671, Kathryn Carter (**Apples**), OMAFRA, Simcoe (519) 426-4322 and for copies of the new Shuttle 15SC label contact Graeme Murphy (**Greenhouse Ornamentals**), OMAFRA, Vineland (905) 562-4141 ext. 106 or visit the Arysta Lifescience North America Corp. website at www.arystalifescience.com

For **summaries of minor use crop registrations**, priorities and active projects visit: <http://www.omafra.gov.on.ca/english/crops/minoruse/index.html>

- The role of commodity organizations in collaboration with the research and services committees is to annually prioritize your key minor use pests and potential solutions.
- These priorities are then added to the provincial minor use priority list for all commodities and then collated by AAFC-PMC into a national minor use priority list.
- Priorities are compared to other provinces and in some cases the US priorities at IR-4, as well as Australian and European Union minor use priorities
- All priorities are reviewed by registrants.
- Top priorities chosen for AAFC-PMC work at the national minor use priority-setting meeting held in Ottawa each year.
- Remaining priorities deferred or submitted by province resources permitting.