



National Strategy to Reduce the Risks from the use of Organophosphate Pesticides in Pome Fruit Orchards

For inquiries please contact:

Pesticide Risk Reduction Program
Pest Management Centre, AAFC
pmc.cla.info@agr.gc.ca

January, 2013

Preface

The [Pesticide Risk Reduction Program](#) (PPRP) is a joint program of Agriculture and Agri-Food Canada and Health Canada's Pest Management Regulatory Agency (PMRA). The objectives of the program, which support the Growing Forward II policy framework, are to develop and implement pesticide risk reduction strategies which help to reduce agricultural risks from pesticides by increasing the use of beneficial pest management practices.

A pesticide risk reduction strategy is a detailed plan that aims to address grower needs for reduced risk management tools and practices for specific pest issues. The strategies are developed through extensive consultation with stakeholders. This document reports on the PRRP's progress on a collaborative pesticide risk reduction strategy to reduce the risks from the use of organophosphate (OP) insecticides in pome fruit orchards.

Acknowledgements

The PRRP acknowledges all participating stakeholders for their contribution and collaboration in the development and implementation of this strategy to reduce the risks from organophosphate pesticides in pome fruit.

Background

Apples are one of the most important fruit crops in Canada with an annual marketed production of 430,301 metric tonnes. They are commercially produced on 17,619 hectares (cultivated area) with key areas of commercial production in British Columbia, Ontario, Quebec and Nova Scotia (Statistics Canada, 2011, CANSIM database).

Apples are attacked by many pests which must be controlled to prevent economic losses. Key pests include apple maggot (*Rhagoletis pomonella*), codling moth (*Cydia pomonella*), European apple sawfly (*Hoplocampa testudinea*) and plum curculio (*Conotrachelus nenuphar*) which directly attack fruit. The severity and importance of these pests vary with region. To manage pests, apple producers follow complex integrated pest management (IPM) programs which include pest monitoring and biological, cultural and chemical controls.

Organophosphate (OP) insecticides (including azinphos-methyl, phosalone, phosmet and diazinon) have been an integral component of pest management in orchards since they were first introduced in the 1960's. These inexpensive materials provided effective control of a broad range of pests. However with concerns about safety to agricultural workers and impact on non-target insects, there was a recognized need for safer alternatives. This need was underscored by the potential loss of many of these materials as a result of re-evaluation by Health Canada to allow new scientific information regarding the impacts of pesticides to be considered. (A review of OP insecticides was initiated in June 1999, as part of Health Canada's program for the re-evaluation of pesticides registered before Dec 31, 1994. (Refer PMRA DIR 2003-03)).

In recent years, new reduced risk pesticides have been registered for use against pome fruit pests. The new insecticides have more discreet modes of action, have more targeted activity against specific pests and pest life stages and are, in general, safer than the OP's to workers and the environment.

The improvements in chemistries also pose more challenges for growers. The application timing of these “softer” materials is more critical and may differ from that of traditionally used pesticides, resulting in the need for modifications to established IPM programs. There is concern over the resurgence of secondary pests previously kept in check as a side effect of the use of the older, broad spectrum insecticides. Replacement chemistries that work by ingestion, rather than contact, can still allow virtually invisible injury to fruit that can be detected during fruit grading, resulting in down-grading or rejection of the crop. In addition, the newer chemistries tend to be more costly than the older insecticides, an important consideration in an industry where profit margins are very low in most years. As a result, although growers have been moving away from the OP’s in favour of these materials, they still face many challenges in fully adopting these materials and implementing effective IPM programs.

The objective of this strategy is to facilitate the adoption of sustainable, alternative pesticides and practices, thereby reducing the risks from OP insecticide use in orchards.

History of strategy development

A working group to address the risk reduction strategy for organophosphates was established in late 2005, with the first meeting taking place in April 2006. The working group consisted of crop specialists, growers, industry representatives and other stakeholders from the key apple producing provinces, British Columbia, Ontario, Quebec and Nova Scotia. Strategy discussions included the identification of key uses of the OP’s, knowledge gaps and barriers to the adoption of alternative reduced risk management practices and pesticides and potential reduced risk solutions for these issues.

In January 2008, the PMRA initiated the azinphos-methyl transition strategy for tree fruit (later expanded to include diazinon) to address the pesticide gaps that would result from the loss of this pesticide. Activities under the transition strategy focused on identifying replacement chemistries and facilitating availability for critical uses that were being lost.

The risk reduction strategy developed for OP use in pome fruit orchards is centered on the need to facilitate the adoption by growers of new chemistries, identify barriers to adoption and find lower risk replacement (biological) pest control products and practices for the control of apple insect pests. As it was not practical to address all pests impacted by the loss of OP’s, strategy efforts focused on four key pests: apple maggot, codling moth, plum curculio and European apple sawfly.

A series of meetings was held in 2009 and 2011 to set strategy goals and targets and develop action plans. Funded projects have contributed to improved grower knowledge with respect to monitoring of pests, timing of reduced risk sprays and the integration of reduced risk pesticides into IPM programs. Work was undertaken to obtain a minor use label expansion for spinosad (GF-120 Naturalyte Fruit Fly Bait), a reduced risk product for use against apple maggot. Further studies have demonstrated to growers various approaches to the application of this product. Work continues to look at new approaches to management of these key pests, as outlined in the strategy action plan table below.

Pome Fruit Organophosphate Pesticide Risk Reduction Strategic Action Plan

Based on the discussions of the pome fruit organophosphate working group, a pesticide strategy to reduce the risks from OP's in pome fruit orchards was developed. The following table outlines the goals of the strategy, identifies the targets and milestones and indicates the activities taking place as part of the strategy and the progress to date.

Strategy Goals	Target	Milestone	Required Activities	Status	Project Completion date/ comments
Goal 1: Reduced risk approaches and tools available for the management of key pests.	Improved treatment decision tools available to growers	Verification of action thresholds	Conduct trials in commercial orchards to verify action thresholds for codling moth and apple maggot, under reduced risk programs.	Complete	March 31, 2010: AAFC project PRR09-030 Facilitating the adoption of pest management approaches to pest management in apples in Nova Scotia . Effective control was achieved with the modified timing of treatments, however additional work is required to verify the revised timing and modify recommendations.
			Conduct follow-up studies to verify the revised timing of pesticide applications.	Future	
		Potential for late season apple maggot damage established	Conduct studies to verify the late season egg laying activities of apple maggots and hence the need for late season controls.	Complete	March 31, 2012: PRR10-050 Incorporation of GF-120 NF Naturalyte Fruit Fly Bait into orchard integrated pest management (IPM) for apple maggot . All female flies trapped throughout the season and into September, carried eggs. Results of field trials, where orchards were protected against apple maggot for different lengths of time, suggested that the potential for late season injury depended on pest pressure and seasonal weather conditions.
	Systems developed that incorporate local weather data into degree day models to predict the need and timing for treatments.	Develop improved access to weather data for growers	Future	The availability of verified degree day models and access to weather data varies among regions. Further discussion is required to identify the needs and best approach to making decision aid systems available to growers, in each region.	
		Validate existing degree day models			
	Alternative products available	Replacement products available for key pesticide uses to be lost through PMRA re-evaluation	In January 2008, the PMRA initiated the azinphos-methyl transition strategy for tree fruit (pomme fruit and stone fruit), (www.hc-sc.gc.ca/cps-spc/pest/part/protect-proteger/regist-homolog/_re-eval/transition-eng.php) to help make available to growers, lower risk pesticides to replace uses of azinphos-methyl (and eventually diazinon) being lost through re-evaluation.	On-going	To date, activities under this transition strategy, have resulted in the registrations of 14 new uses, with an additional 20 new uses having been submitted for registration.

Strategy Goals	Target	Milestone	Required Activities	Status	Project Completion date/ comments
Goal 1: Reduced risk approaches and tools available for the management of key pests. (continued)		Label expansion of GF-120 NF Naturalyte Fruit Fly Bait (spinosad) for apple maggot	Generate and submit data to support the minor use label expansion of GF-120 NF Naturalyte Fruit Fly bait to suppress apple maggot.	Complete	March 31, 2009: Project BPI07-100 Evaluation of the efficacy of GF-120 to potentially replace organophosphate insecticides for control of apple maggots in organic and conventional orchards: The minor use label expansion for GF-120 for apple maggot was obtained June 2009.
		The potential for the parasitoid <i>Lathrolestes ensator</i> , to be used as a control for European apple sawfly, established.	Dissemination of the parasitoid to new orchards and verification of population establishment	Incomplete	PRR10-060 Management of the European Apple Sawfly (<i>Hoplocampa testudinea</i>) using a parasitic wasp (<i>Lathrolestes ensator</i>) . The parasitoid was introduced into new orchards in Quebec, Ontario and Nova Scotia in 2011. Activities to disseminate the parasitoid will continue in future, pending availability of the parasitoid.
			Continue work initiated in AAFC project PRR10-060 in 2010 to determine the sensitivity of <i>L. ensator</i> to pesticides commonly used in conventional orchards.	Future	Adverse weather in the spring of 2011 resulted in insufficient numbers of parasitoids for testing. The project has been terminated and will be resumed, when sufficient numbers of parasitoids are available.
	Improved sprayer technology available	Crop Adapted Spraying (CAS) model that optimizes spray volumes, available to growers	Establish reference values to adapt the CAS model for use in Canadian orchards.	Future	A project has been scoped which would establish reference values for Canadian orchards.
			Verify the established reference values, to adapt the CAS model for use in Canadian orchards.	Future	A project has been scoped which would verify reference values established for Canadian orchards.
	Recommendations available for use of reduced risk pesticides as border sprays	Efficacy of reduced risk pesticides as border sprays established	Investigate the efficacy of reduced risk products as border sprays	Future	Border sprays have been used successfully with the OP's and are a way to reduce the amounts of pesticides used and costs for the grower. Studies are required to determine whether the newer, reduced risk pesticides with more targeted modes of action, can be effectively used in this way.

Strategy Goals	Target	Milestone	Required Activities	Status	Project Completion date/ comments
Goal 2: Reduced risk approaches and tools integrated into IPM systems for orchard pest management	Multiple tools/ approaches combined into recommendations for growers	Guidance developed and provided to growers on use of newly registered pesticides in integrated approaches	Integrate new tools and approaches into orchard IPM and communicate to growers.	Complete	March 31, 2010: PRR09-020 Facilitating the adoption of reduced risk approaches to pest management in apples in Ontario included workshops and demonstration trials that served to familiarize growers with <i>OMAFRA Publication 310 Integrated Pest Management for Apples</i> .
		Incorporation of GF-120 into orchard IPM for apple maggot.	Investigate and demonstrate new approaches to the application of GF-120 to growers.	Complete	March 2012: The application of GF-120, using different sprayer types, was demonstrated to growers under project PRR10-050 Incorporation of GF-120 Naturalyte Fruit Fly Bait into orchard integrated pest management (IPM) for apple maggot .
	Potential for small scale, area wide management of key orchard pests established.	Protocols and criteria established for successful small scale, area wide management of pests.	Investigate collaborative approaches to pest management for small groups of orchards and their surrounding environments.		Area wide management has been very successful in the Okanagan Valley of British Columbia for codling moth. In other regions, high numbers of unmanaged host trees provide sources of fly-in orchard pests, and make this approach to pest management not practical.
			Conduct studies on pest/parasitoid movement and interactions at orchard/ urban/ natural area interfaces.		

Strategy Goals	Target	Milestone	Required Activities	Status	Project Completion date/ comments
Goal 3: Reduced risk IPM approaches, tools, and systems, implemented by growers	Costs/ benefits established for verified, risk reduction approaches and tools.	Evaluation of costs associated with reduced risk pesticide application	Establish the costs of reduced risk approaches and develop sustainable approaches to reduced risk pest management.	On-going	Cost has been identified as an important factor slowing the uptake of reduced risk products. Higher product costs, the need for more frequent sprays and the fact that border sprays cannot be used, contribute to the increased cost of reduced risk programs. An analysis of cost has been incorporated into a number of AAFC projects, including PRR09-020, PRR09-030 and PRR10-050.
	New tools and systems communicated to growers	Presentations, workshops and demonstration trials held to inform growers of new developments	Effectively illustrate project results to growers through presentations and demonstrations	On-going	March, 2010: AAFC projects PRR09-020 <i>Facilitating the adoption of reduced risk approaches to pest management of apples in Ontario and PRR09-030 Facilitating the adoption of reduced risk approaches to pest management of apples in Nova Scotia</i> included workshops and demonstration trials illustrating reduced risk approaches. March 2012: PRR10-050 <i>Incorporation of GF-120 NF Naturalyte Fruit Fly Bait into orchard integrated pest management (IPM) for apple maggot</i> results presented at field days and a grower conference.
			Technical information/ literature prepared and disseminated for growers	Prepare factsheet related to GF-120 use in orchard settings.	Underway
			Make available guidance for sprayer calibration for growers.	Future	The sprayer technology working group has begun to compile training resources for sprayer calibration and orchard spray application.

Strategy Goals	Target	Milestone	Required Activities	Status	Project Completion date/ comments
Goal 4. Measurement of risk reduction achieved.	Demonstrate risk reduction impact of strategy activities in pome fruit orchards.	Measure risk reduction achieved for farm workers and the environment on a project basis.	Demonstrate the benefits of reduced risk approaches to human health and the environment.	On-going	The use of pesticide risk indicators has been incorporated into AAFC projects under this strategy: the Environmental Impact Quotient (EIQ) has been applied in AAFC project PRR09-020 ; the Quebec Pesticide Risk Indicator (QPRI) has been applied in AAFC projects PRR09-030 and PRR10-050 . In general, the new chemistry products pose lower risks to the environment and human health than the traditional OP's, as calculated by the pesticide risk indicators.
		Measure risk reduction achieved for farm workers and the environment on a regional basis.	Extrapolate the risk reduction impact of new tools and approaches on the environment and farm workers.	Future	

Summary of Strategy Outcomes

In summary, the implementation of this strategy is expected to result in the following key outcomes:

- Increased availability of alternative products for the management of orchard pests
- Increased knowledge of growers on economically sustainable, reduced risk approaches to the management of orchard pests
- Increased knowledge of growers on application timing and incorporation of OP replacements into orchard IPM
- Improved accuracy/ efficiency of spray applications that minimize spray drift onto non-target areas
- Greater adoption of OP alternatives such as GF-120 NF Naturalyte Fruit Fly Bait

The new knowledge and tools will assist growers as they transition away from the traditionally used organophosphate insecticides and will help ensure the continued sustainability of pome fruit production in Canada.