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## Program 2010-2311-TO

# Pesticide Use in Fruit and Vegetable Warehouses Final Report

### Abstract

In 2010, Health Canada's Pest Management Regulatory Agency inspected fruit and vegetable warehouses in four regions across Canada (British Columbia, Manitoba, Ontario and Quebec) to assess compliance with the *Pest Control Products Act* and its Regulations. Eleven pest control products (PCPs) registered for warehouse use were reported being used: five plant growth regulators and three fungicides, all for use on potatoes and/or tomatoes, and three hard-surface disinfectants. One expired hard-surface disinfectant and one antimicrobial product registered with the United States Environmental Protection Agency were found in Quebec, and were disposed of and sent back to the distributor, respectively. PCPs were being used according to label directions, aside from a small number of instances of non-compliance with personal protective equipment requirements, which were addressed through verbal education.

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## Background

Fruit and vegetable crops are frequently stored in large warehouses between harvest and transport for retail in the marketplace. Post-harvest application of pest control products (PCPs) often occurs in these warehouses in order to: prevent pest infestations like mice and insects; to reduce spoilage from bacteria and fungi; and to delay ripening times.

The PCPs that may be used in storage areas or on stored fruits and vegetables include:

- **Insecticides** - for the control of flies and other insects, for structural applications
- **Rodenticides** - for the control of rodents inside/outside of facilities
- **Plant growth regulators** - to inhibit germination/ ripening and keep produce fresh longer
- **Fungicides** - for the control of diseases, applied to produce to prevent spoilage
- **Sanitizers / disinfectants** - for surface applications while the storage space is empty or for use in washing water. These may include general sanitizers or disinfectants with no registration number (e.g. chlorine or bleach) or with a Drug Identification Number (DIN), as well as products which have been the object of an evaluation from the Bureau of Chemical Safety (letter of non-objection to use in locations where food is manufactured, prepared or kept for sale).

The Canadian Food Inspection Agency (CFIA) monitors fruits and vegetables in Canadian warehouses via inspections and sampling. For example, federally-registered produce warehouses are inspected monthly under the Food Safety Enhancement Program, which incorporates the food safety control system Hazard Analysis Critical Control Point (HACCP). Produce in these warehouses is sampled for verification of compliance with maximum residue limits (MRLs) and records on warehouses' analysis of microbes in washwater samples are verified. Warehouses holding produce for interprovincial movement, or export, are also inspected by the CFIA to verify MRLs, as are warehouses targeted for monitoring (due to a history of MRL violations).

Pre-consultations with the CFIA have confirmed that although MRL testing may uncover unregistered use or off-label use of pesticides (which may be referred to the PMRA), their inspections do not verify compliance with the *Pest Control Products Act* (PCPA) e.g. with label directions. Similarly, inspections done via the On-Farm Food Safety Program, a Canada-wide food safety program that may be implemented in warehouses upon producer request, do not seek to address compliance issues specific to the PCPA.

Aside from potato storage facilities (inspected in 2004-05 for the verification of unregistered formaldehyde use), and British Columbia fruit packing plants (inspected jointly with the CFIA in 1999), fresh produce warehouses have not been the target of the PMRA's compliance activities.

## Objectives

- To assess information regarding pesticide use in fruit and vegetable warehouses.
- To promote compliance by providing warehouse managers with information on the *Pest Control Products Act* (PCPA).
- To identify any specific compliance issues regarding pesticide use on stored produce inside warehouses.

## Program Delivery

This program was to be carried out over a period of two years, in selected vegetable warehouses in the first year (2010-2011), and fruit warehouses in the second (2011-2012).

Prior to the commencement of the program, regional pesticide officers consulted with federal and provincial regulatory authorities to gather existing knowledge on warehouse regulation in the respective region. Each region decided on the type of warehouses to be inspected, depending on the produce available.

During inspections, discussions related to the PCPA requirements were held between regional pesticide officers and warehouse managers. Information on pesticides used, general warehouse/storage sanitization practices, and the suppliers of pesticides/sanitizers was collected.

Initial inspections determined that pesticide use in warehouses is limited; therefore, instead of inspecting vegetable warehouses in the first year and fruit warehouses in the second year, regional pesticides officers were given the liberty to inspect either type of warehouse in the first year. This did not allow for a variety of fruit warehouses to be inspected, as by the time the program delivery was modified, many types of fruit had gone out of season.

Table 1 indicates the number of planned and delivered inspections carried out across Canada in 2010-2011.

**Table 1: Warehouse inspections for 2010-2011**

Inspections	British Columbia	Manitoba	Ontario	Quebec	Total
Planned	3	10	10	10	33
Delivered	4	9	10	10	33

Upon completion of delivery, each region summarized their inspection results in an electronic reporting template for compliance headquarters in Ottawa. Follow-up to any non-compliance found was carried out by the regions.

## Summary of Results

### Types of warehouses and products

Twenty-five warehouses storing vegetables, seven warehouses storing fruit and one warehouse storing both vegetables and fruit were inspected. Vegetables being stored were mainly root vegetables (potatoes, carrots, parsnips, beets, and rutabaga) and onions. The only fruit stored in the inspected warehouses were apples and cranberries.

Some form of chemical treatment, either a PCP registered for warehouse use, or a disinfectant/sanitizer, was used in 24 out of 33 (73%) of the warehouses inspected (Table 2).

In the 15 warehouses using PCP's, 11 different registered products were found (Appendix 1). There were three hard-surface disinfectants being used to clean surfaces and equipment. The registration of one of these disinfectants had expired at the time of inspection. The five plant growth regulators and three fungicides used were for apples and potatoes in storage. There was also an unregistered United States Environmental Protection Agency (EPA) antimicrobial product found.

Disinfectants and sanitizers were used on the warehouse walls, cooler, equipment and floors (Appendix 2). As well, chlorine dioxide was used on potatoes and in washwater; ozone was used on onions; and chlorine and ammonium defoaming products were used in washwater. Only three of the disinfectants and sanitizer products found had a DIN.

Just under one half (14/33 or 42%) of the warehouses reported using rodent control products, either a PCP in a bait station, or mechanical traps and cages.

**Table 2: Warehouse use of products**

Product	British Columbia	Manitoba	Ontario	Quebec	Total
<b>Chemical treatment</b>	4/4	7/9	7/10	6/10	24/33 = 73%
<b>PCP</b>	2/4	2/9	6/10	5/10	15/33 = 45%
<b>Disinfectants and Sanitizers</b>	4/4	7/9	7/10	4/10	22/33 = 67%
<b>Rodent control</b>	0/4	5/9	6/10	3/10	14/33 = 42%

### Application of products

All plant growth regulators and fungicides were applied by certified pesticide applicators (a warehouse manager, a farm owner, or a custom applicator). Fogging and fumigation type equipment were used for these applications.

Application of disinfectants and sanitizers to warehouse surfaces was done by spray bottles, mop and pail, and pressure washer. One warehouse had a metering unit that would dispense the needed amount of product.

Of the warehouses using PCPs, 13 out of the 15 kept application records. The two warehouses that did not keep records used custom applicators to apply pesticides.

### Worker safety

A chemical supplier or consultant (six warehouses) and the pesticide label (nine warehouses) were the most commonly used information sources to determine restricted entry intervals (REIs). Of the 15 warehouses using PCPs, 13 used products requiring an REI, but only 10 warehouse managers reported following REIs (Table 3). Out of the three warehouses where managers did not report following REIs, two used a custom applicator, so it is possible that REIs were followed, even if they were not communicated with warehouse managers. At the third warehouse where the pesticide applicator was an employee, the use of a PCP according to label directions was discussed. REI protocols included locking doors after the product was applied, use of automatic fans and an ozone detector, labelling of rooms treated, and verbal notification of employees.

A chemical supplier or consultant (seven warehouses) and the pesticide label (nine warehouses) were used to determine what personal protective equipment (PPE) was required. Provincial and government internet sites were also used by two warehouses. Thirteen out of 15 warehouses reported using PPE. The question on PPE was not product-specific, therefore, it is difficult to determine the level of compliance with PPE requirements, as they change depending on the product used. However, one of the common requirements for all products is gloves. In the warehouses using PPE, there was an 85% compliance rate with wearing gloves.

The indicator of PPE knowledge was based on whether the person interviewed knew: 1) why PPE was required; and/or 2) that different PPE was required for different products. However, knowledge of why PPE should be worn does not always equate to compliance with wearing the PPE specified on the label.

**Table 3: Safety requirements observed in warehouses applying pest control products**

Safety requirement	British Columbia	Manitoba	Ontario	Quebec	Total
<b>REIs followed</b>	1/1	1/2	5/6	3/4	10/13 = 77%
<b>PPE worn</b>	1/2	2/2	5/6	5/5	13/15 = 87%
<b>Gloves worn</b>	1/2	2/2	4/6	5/5	11/13 = 85%
<b>PPE knowledge</b>	1/1	1/2	3/6	3/5	8/15 = 53%

#### Storage and disposal

PCPs were stored alongside cleaning products (e.g. under the sink) or in a locked room or shed. One expired product was found in inventory in Manitoba. There were no other compliance issues with storage or disposal. The 23/24 warehouses that answered the container disposal question said that containers were returned to the distributor/retailer or municipal disposal site; one warehouse only used bleach and put empty containers in regular recycling. With respect to warehouses with waste washwater, four disposed of water as regular waste and an additional 17 had holding ponds and/or treatment systems on site.

#### Follow-up to non-compliance found

Verbal education was used to remind users to follow label directions for re-entry intervals and PPE.

Overall, there were five Compliance Results Tracking (CRT) forms completed: one in Manitoba for expired product in storage, two in Ontario for unregistered use (in the field, not warehouses), and two in Quebec for use and sale of an unregistered antimicrobial product. Written education and enforcement letters were taken as an enforcement response to these issues of non-compliance.

### **Outcomes/Conclusions**

Overall, this program did not find many compliance issues regarding pesticide use on stored produce inside warehouses. The few issues found were minor (e.g. use of expired product, EPA product, and PPE) and easily addressed. It is not evident if the information gathered through this program concerning PPE label requirements provides an accurate depiction of user compliance in this area. More detailed questions are needed to confirm user understanding.

Since British Columbia did not inspect the fruit warehouses this year due to delays in program approval, this program should run again in British Columbia in 2011-2012 so these inspections can be completed. A continuing national program in this sector is not needed at this time.

## **Recommendations**

- This program should continue in BC for additional fruit warehouse inspections.
- Questions on Personal Protective Equipment (PPE) worn should be product specific in future inspections.
- Improved messaging on the risk from not wearing PPE is needed.

# **Appendix 1: Pest Control Products used in Warehouses inspected in 2010-2011**

Product Name	PCP Reg. #	Active ingredient	Use location	Regions where used	Number users
<b>Hard-surface disinfectant</b>					
Ag-Services Inc. General Storage Disinfectant	14957	N-alkyl dimethyl benzyl ammonium chloride	Surfaces	MB, ON, QC	5
Kleengrow	13148	Didecyl dimethyl ammonium chloride	Equipment	BC	1
Javel 12 Sodium Hypochlorite *	21673	Sodium Hypochlorite	Equipment	QC	1
<b>Plant Growth Regulators</b>					
No-Scald DPA EC-283	13471	Diphenylamine	Apples	ON, QC	3
Smart Fresh Technology	27778	1-Methylcyclopropene	Apples	ON	3
Sprout Nip Pellets	29037	Chlorpropham	Potatoes	ON, QC	2
Shield DPA 15% Super Refined	18983	Diphenylamine	Apples	ON	1
Sprout Nip 840 Sprout Inhibitor for Potatoes	18833	Chlorpropham	Potatoes	ON	1
Sprout Nip	Unknown	Chlorpropham	Potatoes	BC	1
<b>Fungicides</b>					
Mertect SC Fungicide	13975	Thiabendazole	Apples	ON, QC	2
Storox	27432	Hydrogen peroxide	Potatoes	ON	2
Confine	29100	Mono- and di potassium salt of phosphorus acid	Potatoes	MB	1
<b>Antimicrobial</b>					
Tsunami *	EPA 1677-164	Peroxyacetic acid, sodium hypochlorite	Cranberry processing water	QC	1
<b>Rodenticides</b>					
Unknown product	unknown	unknown	Warehouse	QC, ON	3

\* unregistered product



**Appendix 2: Sanitizers/Disinfectants not regulated under the PCPA  
and used in warehouses inspected in 2010-2011**

Product Name	DIN #	Use location	Regions where used	Number of users
Bleach		Warehouse, cooler, equipment, washwater, floors	BC, MB, QC, ON	8
Chlorine dioxide		Washwater, potatoes	BC, MB	2
Hortikhlor		Floors	BC	1
Hyper ox	02240361	Clean up	BC	1
Hypochlor 12 bleach		Clean up	BC	1
Sodium hypochlorite (chlor cling 937)		Belts, floors	BC	1
Chlorine		Washwater	MB	2
Chlorine	02265729	Washwater	MB	1
Ozone		Onions	MB	1
Pinosan (Dustbane Products Ltd.)	02213133	Warehouse	MB	1
ZEP Supermarket Sanitizer		Floors	MB	1
ZEP Morado Super Cleaner		Floors	MB	1
Bioblock		Holding pond	ON	1
Dibac		Carrots	ON	1
Drewplus		Washwater	ON	1
Ecosan		Washwater	ON	1
Q-San Sanitizer		unknown	ON	1
Quats		Washing rooms	ON	1
Spectrum multi-surface cleaner/degreaser is use		Equipment	ON	1
Chloragel		Warehouse, equipment	QC	2
AlcoSpray		Belts	QC	1
Hurricane		Walls, floors	QC	1