

# **Pesticide Use, Maximum Residue Limits and the Impact on International Markets**

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## **Introduction**

Pesticides play an important role in maintaining Canada's food supply by protecting crops from losses due to weeds, insects and disease. Many pesticides used on crops such as herbicides for the control of weeds, insecticides for the control of insects and fungicides for control of plant diseases are designed to manage the pest they target through toxic means. In some cases residues of these pesticides will remain in or on the crop or crop byproducts after they have been treated.

To prevent the use of pesticides from having an adverse affect on human health, the environment or the safety of feed or food, Canada Pest Management Regulatory Agency (PMRA) performs a thorough assessment of the potential health and environmental risks associated with pesticides. Before any pesticide is allowed for sale or use in Canada this rigorous evaluation process facilitates the establishment of maximum safe levels of pesticide allowed remaining on or in the feed or food when it is sold to the Canada consumer.

Canada's export customers have similar regulations that set limits on the pesticide residues that are acceptable for entry into respective country and on occasion the use of Maximum Residue Limits ( MRL) has been viewed as a trade irritant.

Understanding how pesticide are registered and how acceptable residue levels are set will assist in the managing and minimizing the impact of pesticide residues have on export markets.

## **Pesticide Registration in Canada**

The PMRA's mandate is to protect human health, safety and the environment by minimizing the risks associated with pest control products while providing access novel and innovative pest management tools and strategies. Pesticides that are imported for sale or use in Canada are regulated under the Pest Control Products Act (PCPA). The PMRA administers this legislation and ensure that pesticides are thoroughly evaluated before registration. Manufacturers must submit a comprehensive data package to document that their product can be used safely and it meets the criteria outline in the legislation.

For pesticide used in the production of food and feed crops, extensive data are required including:

- A complete range of research studies that examine the toxic effects of the pesticides, including the impact on the reproductive function and the occurrence of cancer in animal studies

- Information on the physical and chemical properties of the pesticide

- Documentation of the lowest effective dose of the pesticide, the frequency and time of application

Plant and animal metabolism research demonstrating how the pesticide is broken down in the body and in the plant  
Analytical methodology used to detect residue in food and feed  
Documentation of the amount of residue that could be found in food or feed

The complete data packages for registration takes many years to produce and manufacturers must ensure all requirements are met before registration is granted by the PMRA. The PMRA then determines the acceptable residues levels. Pesticide residue levels in food or feed are regulated by establishing maximum residue limits (MRLs)

### **Determining Acceptable Residue Limits in Canada**

PMRA evaluates of the toxicity data provided by the pesticide manufacturer to assess the potential hazard associated with the use of the pesticide. Toxicity tests in animals are used to examine the potential wide range of effects such as changes in fertility, reproduction, effects to organs such as kidney and liver and any neurological effects. These studies are used as an indication of the potential impact in human and human health.

These animal studies assist in establishing the “no observable adverse effect level”, which is the dose that shows no harmful effect in the animal. In extrapolating to humans this dose is then divided by a minimum of two uncertainty factors:

A 10- fold factor to make the figure applicable to humans

A 10-fold factor to account the variability in the human population

Recently PMRA has an additional 10-fold factor to be applied to further protect infants and children. New pesticide and re-evaluation of older registered pesticides must meet these safety standards. Additional factors maybe included to address severity of hazard or other uncertainties.

Once the all the uncertainty factors have been included, the resulting dose is regarded as acceptable daily intake (ADI). The ADI therefore is the amount of pesticide residue that is considered to be safe for humans to consume each day for an entire lifespan. The acceptable dose is at least 100 times the “no observable adverse effect level”.

Dietary risk assessment takes into account different eating habits when determining potential daily intakes (PDI) of pesticide residues. This assessment must show the potential daily intake for each age group is below the acceptable daily intake before PMRA will grant registration. This is where the MRL'S come into play.

MRL's are established to ensure that the consumption of residue from all food uses will not exceed the ADI for a particular pesticide. **MRL's are based on the maximum amount of residue that may remain in the food when the pesticide has been applied according to the registered use pattern.**

MRL's are established for all types of food. Depending on the pesticide and the food commodity, allowable residues can range from a fraction of a part per million to several parts per million.

Canadian MRL's apply to residues in food produced in Canada and food imported into Canada. PMRA is working with other country in harmonizing the MRL's so that international standards are develop thereby minimizing the possible use of MRL's as a trade irritant.

### **Monitoring**

The Canadian Food Inspection Agency (CFIA) monitors both domestic and imported commodities for pesticide residues when they are sold in Canada. If CFIA determines that the residues exceed the MRL the commodity may be seized or recalled. The CFIA also posts a list of non-compliance.

CFIA has monitored 44,379 shipments of fresh and processed fruits and vegetables from 1994-1998, with 98.2 % having residues within the acceptable limits. Interestingly, 80 % of these samples showed no detectable residues.

The key is that all this science has been used to ensure the safety for human health based on the labeled application of the pesticide. Under the PCPA, it is an offence to use a pesticide under unsafe conditions or to apply it other than according to label instructions.

PMRA in-conjunction with the provincial officials, monitor and investigate possible violations of the PCPA.

### **International MRL's**

Other countries set their own maximum residue limits and Canadian exports must comply with the importing countries MRL's. Before shipping commodities to other countries it is critical to know what pesticide residues are allowed in that country. Most countries will provide a list of the acceptable MRL's. Canada ships to many countries including the United States, Europe, and Japan, to name a few.

There has been a lot of media coverage regarding the Japanese market. Recently Japan implemented a new regulation for residues of agricultural chemicals in food. The Japan's Ministry of Health, Labor and Welfare (MHLH) established provisional MRL's for 758 agricultural chemicals, in addition to the existing 10,000 MRL's and a uniform limit of 0.01ppm for residues not on the list. MHLH has also established a list of 15 chemicals for which no residues may be detected because of high human health risk. The existing MRL's and the provisional MRL's make up the "positive list", this regulation means that food containing residues exceeding the MRL's on the list, or 0.01 ppm in the case where there are no MRL's established, will be prohibited in Japan. Monitoring will not change, but each sample will be tested for more residues.

Action to be taken when residues are found above the MRL's, will include discarding, re-exporting, reconditioning or otherwise disposed of. The consequence is that monitoring is intensified for products from the country where the original violation occurred. So for example, when monitoring test results determine there has been a violation, the first consequence is that monitoring of the same product from the same county of origin is increased by a factor of 10, usually to 50%. If a second violation is found under the increased monitoring program, testing – by order would be implemented. Testing-by order is a mandatory testing program under which

each shipment has to be held until test results show that the product is not in violation and is at the expense of the importer. If the problem persists, MHLW may implement a ban of imports

### **The Japanese Market**

Japan, the world's largest net importer of agri-food products, is Canada's second most important agri-food export market. About 50% of Canada's exports to Japan are agri-food products. In 2002, Canada's agri-food exports to Japan totaled \$2.38 billion, of which almost 60% was grains and oilseeds and their products and 32% was livestock and its products. Japanese consumers, like their Canadian counterparts, are very quality conscious and are highly concerned about food safety. The recent policy and program changes in Japan and the implications for Canadian agri-food exports can be found at

: [http://www.agr.gc.ca/mad-dam/e/bulletine/v16e/v16n20\\_e.htm](http://www.agr.gc.ca/mad-dam/e/bulletine/v16e/v16n20_e.htm)

### **So what are the implications for Canada**

#### **Canola**

Nearly 75% of the Canadian canola crop is exported annually. Long-term access to export markets is critical to the Canadian canola industry. Japan is the number one export market for canola seed and one of the most reliable markets. The Japanese view Canada as a valuable source of high quality canola. Other markets include Mexico, China, and Pakistan. The US export market is focused on refined products, such as canola oil and meal.

Export markets are valuable customers, and like any customer, they have specific requirements and expectations regarding quality of products and services. These markets are in turn responding to demands from customers within their country. Globally the trend is the general public is more aware and sensitive to issues on food quality and safety. Our export markets do have a choice of sources for canola, so it is important to meet the increasing requirements of our export customers. Protecting Canada's image as source of quality canola is critical to maintain our market position.

With the recent implementation of the Japanese "Positive List", the challenge is for Canadian producers to protect this valuable market. Derwyn Hammond, Agronomist, Canola Council of Canada, indicates that the canola industry has done a great deal of work to ensure that all products commercially used in canola have an acceptable MRL for Canadian export markets. It is essential that producers follow label application rates and timing, in addition to avoiding any unregistered uses. Following the application timing/s outlined on the pesticide label is critical to ensure that the preharvest intervals are met and MRL are not exceeded. The Preharvest Interval is the number of days from the time of application of the pesticide to the cutting of the crop.

### Preharvest Intervals for Insecticides and Fungicides registered for use in Canola

Product Name	Pre-harvest Interval (days)
Quadris	30
Lance	21
Furadan	60
Lorsban	21
Matador	7
Ripcord/Cymbush	30
Decis	7
Rovral Flo	38
Malathion	7
Monitor	10
Lannate	8
Tilt 250E; Bumper 418 EC	60
Dylox	21
Ronilan EG	40

Source: Canola Council of Canada 2006

In August 2006, an Australian canola cargo was found to contain a pesticide over and above maximum residue limits set by the Japanese. Cost of dealing with the rejected shipment by the importing country can be high. A vessel of canola seed can be worth approximately \$6M dollars and can cost \$2M dollars to deal with the cargo, either by finding alternative markets or disposal costs. But it is the disruption of trade and the tarnishing of a stellar reputation that is the bigger cost to the industry as a whole.

Recently, the Canola Council has been advising industry representatives and producers not to use malathion in grain storage facilities. Growers are reminded to avoid both stored product treatment and empty bin insecticide treatments prior to storing canola. Malathion is not registered for this use and had been previously been detected in tests conducted by the Canadian Grains Commission (CGC), which does routine monitoring of canola shipment for pesticide residues. Due to the warm fall conditions this growing season, stored grain insects are of particular concern. Growers are recommended to check the Canola Council of Canada website for details on alternative methods for controlling stored grain insects. <http://www.canola-council.org>. Or checkout the excellent resources and guidelines available from the Canadian Grains Commission and Agriculture and Agri-Food Canada on the following website [http://sci.agr.ca/winnipeg/cgs\\_e.htm](http://sci.agr.ca/winnipeg/cgs_e.htm)

Growers are also encouraged to dispose of seed treatments containing lindane. Lindane is no longer registered or sold in Canada, and old product should not be used. Sold under trade names, Cloak, Vitavax RS, Foundation, Premiere, and IPC Benolin-R Insecticide-Fungicide Dust, lindane is not registered in the United States and no tolerance levels exist for lindane residues in canola.

## **Cereals**

Mike Grenier, Agronomist with the Canadian Wheat Board recently compared Canadian MRL's on wheat to other countries. Of the 69 active ingredients used on wheat, 29 MRL's are equivalent to Japan's and 27 Canadian MRL's are more stringent, while 13 Japanese MRL's are more stringent than Canada's including one no-detection pesticide MRL for Amitrol-T. In the case of Amitrol-T, it is advisable that growers strictly follow the label rates and use only as a pre-seed application to ensure that no residues will remain in the seed.

## **Bottomline - How Are We Doing**

Canadians are faring well on the export stage, thanks in part to stringent testing by the CGC, and increasingly responsible use of products by farmers. The CGC set up a monitoring system in the 1960's and now monitor for 200 compounds, 20 mycotoxins, and heavy metals. Two pesticides routinely show up in samples, glyphosate and malathion, but at levels well below established MRL's.

## **Managing to Minimize Risk**

Growers need to be aware that MRL's are a concern for export markets. Although this sounds like a complex job for grower associations and exporters, the easiest way to manage MRL's for growers' to follow product labels right down to the fine print, with special attention to PreHarvest Intervals.

So the important application consideration is to ensure that a pesticide is not applied beyond the pre-harvest interval. For example, Lorsban shouldn't be applied for the control of lygus bug in canola within 21 days of harvest. Applications beyond the pre-harvest interval can mean residues greater than allowable MRL's. These guidelines apply to every crop and pesticide registered for sale in Canada.

Registered products should only be used on registered crops at registered rates and timings. When pushed into a corner by a pest problem, growers might be tempted to try an unregistered product on a crop. Not only is this a contravention of the label, but this practice could have negative consequences for Canada's very valuable export markets. If in doubt, consult an agronomist for the best recommendations on how to control a pest.