Fresh Facts for Industry: Integrated Pest Management

For many years, crop protection in Canada has included the widespread adoption of **Integrated Pest Management (IPM)** on fruit and vegetable farms in Canada. IPM takes a variety of monitoring techniques and biological, cultural and chemical measures to control pests in an ongoing management program. This approach combines traditional farming techniques and new technology. In response to environmental concerns, pest resistance to chemicals and the cost of pesticides, horticultural growers have been changing their agricultural practices. One goal of IPM is to work with natural controls as much as possible, using pesticides only when other control methods can't prevent lost income due to crop damage.

IPM is based on the premise that it's not necessary or cost effective to try to eliminate an entire population of pests. Instead, researchers and pest management specialists establish thresholds to determine when control is necessary to bring pest populations down to less harmful levels. When the number of pests reaches the threshold, a pesticide must be used to prevent excessive crop damage or loss that is greater than the cost of preventing that damage. Specialists take into account the stage of development of the pest and the crop, the type of injury the pest causes to the crop and other criteria such as the number of pest predators and weather factors when setting thresholds. Since conditions affecting pests are continually changing, re-evaluation of these thresholds is ongoing. This requires a thorough understanding of pests so that biological, cultural, mechanical and chemical control techniques support each other.

IPM systems have benefits for both growers and consumers of fruits and vegetables. Growers can have lower input costs by reducing the need for chemicals and they have less personal exposure to chemicals. IPM is directly responsible for decreasing the amount of pesticides in the environment. Also, improvement in timing and choice of spray materials allow growers to control pests before they can cause significant damage to the crop. For consumers, this results in higher quality produce. As well, by reducing pesticide use and properly alternating materials used, growers can prevent the development of pesticide resistance in pests. Beneficial insects are also preserved in IPM systems and can then contribute to the overall control program.

History of IPM in Canada

IPM is not a new concept. Canadians have been at the forefront of research into reducing the use of chemicals without lowering crop yield or quality since the 1940's. This research was pioneered in Nova Scotia by Dr. A.D. Pickett and associates from Agriculture Canada. In 1968, researchers at Vineland Station, Ontario, investigated ways to reduce the use of pesticides in apple orchards without increasing damage to the fruit. By monitoring pests, the timing of pesticide applications was improved to the point where a 40 to 50% reduction in the number of sprays was needed for adequate control. By 1974, the development of a computerized forecast and early warning system made available pest and weather data to apple growing areas in Ontario.

In previous pest management programs, spraying schedules and calendars were based on a 7- to 10-day spray schedule. Now, using pest population monitoring techniques, spraying is limited to times when pests are present and at their most susceptible stages. Initial use and field testing of IPM has increased grower confidence in the program. Crops are chosen as candidates for IPM on the basis of three major criteria: significant pesticide use; overall value of the crop in the region and/or large crop area; and research information available on pest biology, monitoring techniques, thresholds and control strategies. As a result of successful programs, horticulture grower groups are becoming more involved in the funding of more IPM programs.

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IPM Programs in Canada

Three types of IPM programs are carried out across the country. Provincial government agriculture departments run regional IPM programs. They gather information from representative farms in an area and provide it to growers through recorded phone messages and newsletters. Some provinces also have local pest management specialists available for pest monitoring and advisory services. In addition, grower groups can hire scouts to provide information on an individual farm basis as part of a more intensive IPM program. A grower can also pay for private consultant programs which monitor and make recommendations for an entire farm.

Monitoring Techniques

Monitoring is a key component of an IPM program. Pest population and weather monitoring techniques allow a grower to accurately determine if pests are numerous enough to require control. Fields are scouted once or twice a week to assess any changes in pest numbers or activity.

Visual traps are useful tools to monitor the number of insects that are actually within the orchard or field since they attract insects from relatively short distances. Yellow sticky boards and red sticky spheres that mimic fruit are placed in orchards to attract insects such as the apple maggot fly. Pest management specialists can accurately predict where a spray should be applied based on when flies are first caught by the traps. Cardboard "tents", baited with a female insect scent called pheromone, lure males into sticky traps. Based on the number of male insects that are caught in the pheromone traps, growers can determine the best time to treat the crop and when to hold off. This increased efficiency allows as much as a 75% reduction in pesticide applications without affecting pest control.

Looking directly at the leaves and other parts of the plant is another way to monitor pests. Numbers of insect pests can also be determined through random sampling of tree branches, measuring pest levels in ground growth with sweep nets and sampling the number of insects that fall from fruit trees into tapping trays. Information gathered from weather recorders is also important since temperature and moisture affect the development of disease, insects and mites. By using average temperatures and the number of hours that the leaves remain wet, growers can now predict when fungal infection will occur. This is used for crops such as apples, onions and tomatoes.

Control Techniques

Many of the non-chemical pest control practices and principles in IPM programs have been used by growers for years. Cultural methods such as crop rotation, use of pest resistant crop varieties and mulches to suppress weeds are all effective in preventing pest buildups. As well, removing crop debris reduces carryover from year to year of diseases and insect pests.

The development of crop varieties that are resistant to pests – **Genetically Modified Organisms (GMOs)**, for example - is an important part of IPM control. IPM systems also rely as much as possible on a pest's natural enemies. Beneficial insects or diseases which attack pests without harming the crop are bred for pest control. For

example, parasitic wasps can be let loose in greenhouses to kill insect pests which damage crops. In some horticultural crops, bacteria which produce a substance poisonous to harmful insects are being used.

Some growers also use mechanical pest control techniques. Examples are: field vacuums which suck destructive insects right off the plants; screens or barriers which protect the crop; and yellow and blue sticky boards used to trap insect pests in greenhouses.

While non-chemical control methods are important tools in IPM systems, they are not sufficient to solve all pest problems in a crop. Pest populations can "explode" before non-chemical methods have a chance to work. Sometimes the only way a crop can be saved from significant damage or total destruction is through use of chemicals. Many advances have been made in chemical controls with excellent results attainable at much lower amounts. Pesticides chosen for IPM programs are the least harmful to beneficial insects and the environment.

Through the integration of these various control methods, the need for chemical control can be greatly reduced. Pesticides are used as a last resort in IPM programs when pests reach threshold levels. Monitoring techniques allow improved timing of pesticide applications to the pest's most vulnerable stage of development.

How do growers learn about IPM?

Regional information gathered from representative farms is relayed to the grower through daily phone recorded messages. These messages provide data for specific areas on weather, horticultural advice, news on pest levels and general information for IPM programs. Newsletters containing more detailed information are mailed out regularly to growers to update them on predicted pest problems for the near future. Training courses, as well as on-site farm meetings, educate the growers and scouts on the biology of insect and disease pests and monitoring techniques. Finally, spray recommendation booklets and fact sheets on pest biology and monitoring techniques are available to Canadian growers.

CPMA Contacts and Other Resources

For more information, please contact CPMA at question@cpma.ca, or use the following resources:

- Agriculture and Agri-Food Canada Pest Management Centre
- Agricultural Pest Management
- Integrated Pest Management projects
- Pest Control Products Act