

Integrated Pest Management Program - IPM Manual for Home&Garden Pests in B.C. - Chapter 1

Integrated Pest Management

IPM Manual for Home and Garden Pests in British Columbia

Chapter 1: What is Integrated Pest Management?

Learning Objectives

When you have completed this chapter, you should be able to:

1. Define Integrated Pest Management (IPM) as it applies to home and garden pest problems.
2. List the five main steps in an IPM program.
3. Explain the importance of correctly identifying pests.
4. Explain how visual inspections are used in monitoring pest populations.
5. Define injury level and describe how treatment actions relate to injury levels.
6. Describe common pest prevention methods and give examples.
7. Describe four types of pest controls and give examples.
8. Describe problems arising from pesticide use.
9. Explain the role of the pesticide dispenser in ensuring safety of customers and staff at the vendor site, and in providing information about IPM for customers.

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Introduction

The intent of this chapter is to clarify and standardize what is meant by Integrated Pest Management (referred to as IPM) as it applies to the home and garden sector. A dispenser that understands the concepts of IPM will be able to pass on effective pest management information to customers, while helping them protect the environment and human health.

Integrated Pest Management is an approach that emphasizes prevention of pest problems and the use of least-toxic controls. IPM programs follow a decision-making approach to managing pests, starting with making sure pests are correctly identified. In an IPM program, treatments are only applied according to need as shown by a

monitoring program, in contrast to regularly scheduled applications or "calendar" sprays. One or more types of treatment may be combined in an IPM program to provide the desired level of control and to prevent future pest problems.

Over the last 10 to 15 years, IPM methods have been successfully used to manage pests of all kinds, including plants, animals and diseases. IPM programs are increasingly used in forestry, landscapes and parks, and for household and garden pests. IPM programs continually improve as new products are developed and as information from research and practical experiences becomes available.

General Definition of Integrated Pest Management

The following definition was incorporated into the *Pesticide Control Act* (BC) in 1997.

"Integrated Pest Management" means a decision-making process that uses a combination of techniques to suppress pests and that must include, but is not limited to the following elements:

- planning and managing ecosystems to prevent organisms from becoming pests
- identifying potential pest problems
- monitoring populations of pests and beneficial organisms, pest damage, and environmental conditions
- using injury thresholds in making treatment decisions
- reducing pest populations to acceptable levels using a combination of biological, physical, cultural, mechanical, behavioural, and chemical controls
- evaluating the effects and efficacy of treatments

A complete IPM program based on the above description would be too complicated for most home and garden customers. There are several key IPM practices that dispensers should explain to their customers to help them achieve satisfactory, long-term control of pests.

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Components of an IPM Program

"An ounce of prevention is worth a pound of cure" is nowhere more true than in managing pests. Ideally, a pest management program starts with prevention. However, most customers asking for help almost always have an existing pest problem that must be dealt with before they can take preventive steps.

When customers ask for help with pests, a well-informed dispenser should be able to guide them through the basic steps of an IPM program. These are:

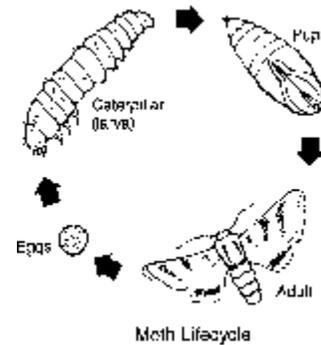
- identification
- monitoring
- action decisions
- treatments
- evaluation

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Identification

Before recommending any type of treatment, particularly a pesticide, it is essential to identify the problem correctly. First of all, it is important to determine whether or not there is a pest problem. In home landscapes and gardens, damage to plants is more likely to be caused by environmental conditions, such as drought, nutrient deficiency, sunscald, frost, salt or wind burn, dog urine, or mechanical damage, than it is from pests.

If a pest population is causing a problem, then it should be identified (to species if possible) so that information about it can be looked up in the Common Home and Garden Pest section of this manual, chapters 11-15, and in other references. The key to planning a control program that works is knowing the life cycle of the pest and the conditions that favour its development.



Learning about the pest helps customers to:

- know what to look for and where to look to keep an eye on the problem
- apply controls at the right time and place to be most effective.
- plan an effective prevention program

When pest problems are identified based on plant damage, careful identification is essential because similar looking damage can have different causes. For example, curled leaves from a virus disease look much like damage caused by sucking insects. Spraying an insecticide would be useless if the plant symptoms were caused by a disease. Also, damage caused by nutrient deficiencies or poor growing conditions may be mistaken for signs that pests are present.

Identification is also important when customers have caught an insect they associate with plant damage. Often, it turns out to be to a beneficial species that was feeding on the pests that caused the leaf damage.

Identify Pests By:

- comparing specimens with pictures in reference books or on the internet
- recognizing characteristics of damage or of the excrement and castings left by pests
- consulting experts for assistance

It is very helpful to customers if the dispenser or someone at the vendor site is able to identify common pest problems, including plant disorders caused by poor conditions. This could benefit the vendor by attracting customers to use this service.

If the problem cannot be identified by the dispenser or other staff, customers should be directed to:

- master gardener
- clinics held periodically at local nurseries
- information lines run by Van Dusen Gardens and UBC
- reference books
- electronic resources on the internet

Note: Provincial government staff do not provide identification services to the general public, however, nurseries and other businesses can send specimens to the provincial laboratory for identification and recommendations.

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Monitoring

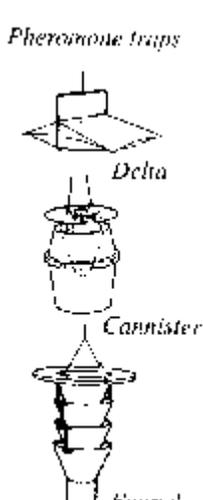
Monitoring consists of regular inspections to find out the extent of the pest problem and whether it is getting better or worse. A basic monitoring program would be a regular (daily or weekly) visual inspection coupled with written notes. People often notice plant damage after the pests that caused it are gone, therefore even a small amount of time spent on monitoring a problem can pay off by showing whether or not there is still a need for treatment.

More complex monitoring programs using sampling tools, such as insect traps, are available for commercial and hobby farms. For most home and garden customers the emphasis should be on making frequent, close, visual examinations to:

- detect problems while pest numbers are low and easier to control
- assess the size of the pest population and extent of damage
- look for conditions that contribute to the pest problem
- find out whether treatments are working

Insect Monitoring Traps

Sticky Traps: Some insects are attracted to bright yellow or other colours so they can be caught on coloured sheets of plastic or cardboard that have been coated with sticky glue.



Yellow sticky traps attract adult whiteflies, flower thrips, Fungus gnats, leafminers and cabbage loopers. Bright blue traps are also available for flower thrips. Such sticky traps are usually used as a monitoring tool in greenhouses, although they can also be used as a control on indoor plants. By regularly checking the sticky traps a gardener can find out when the first of the adult insects are present among the plants.

Pheromone Traps: Individually packaged pheromone attractant traps are available for monitoring some species of moths. The traps are baited with a lure that mimics the odour given off by female moths to attract males for mating. The traps are used to find out when the main flights of adult moths occur so that sprays can be put on at the right time to have the greatest effect.

Orchard growers use traps to time codling moth sprays so that they are used when the most moth eggs are hatching into caterpillars. Pheromone traps would not be useful for most backyard gardeners, because the gardener would not know how to relate the number of moths caught to a need for treatments.

Gardeners Beware! #1

Pheromone Traps: Individually packaged pheromone attractant traps are now sold for pests such as codling moths and cabbage loopers. Some package labels imply "proven, effective" control of these pests in home gardens. Unfortunately, this is not possible with these traps alone because they only attract adult males. Since it is the females that lay eggs, the traps can not control a moth population.

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Action Decisions

Deciding when to take action and apply treatments is based on information obtained by regularly monitoring the pest situation. The key idea is that treatments are made only when and where monitoring shows they are needed and not on a pre-set schedule. This also means that pesticides would not be used just because it is a certain time of year (there are some exceptions, such as dormant oil sprays used in winter).

Injury level is the acceptable amount of injury or damage that could be tolerated from a particular pest population. In a home or garden, "injury" includes damage to the appearance of landscape plants, loss of fruit and vegetable crops, and sometimes health hazards posed by insects, such as yellowjackets. Without realizing it, people tolerate a certain amount of pest damage because they simply don't notice it. A close look at landscape plants, lawns, and gardens will always turn up a few plant-eating insects, weeds, and even some signs of disease, but this is rarely a cause for concern.



Often treatments are used where pests are causing little or no damage because the customer is afraid that the problem will spread or eventually kill the plant. The dispenser should be able to help customers determine which species pose a problem and which are of little concern. Dispensers can also reassure customers that even plants that look heavily damaged, for example from tent caterpillar attack, may suffer little long-term harm. They also should know that it is desirable to allow low numbers of pests to remain because they are food for the beneficial insects and birds that continue to keep pest numbers low. When pests are eradicated in a local area by pesticides, their natural enemies are either killed or move away because their food supply is gone. It is not uncommon for pest numbers to reach more damaging levels after pesticides are used because the natural enemies are no longer present to keep the pests in check (for example, aphids on fruit trees will often recover to higher than pre-treatment densities after use of an insecticide that kills aphid predators). This underlines the importance of using non-toxic methods for managing pests and highlights the role of the dispenser in educating customers.

It will be a new idea to many customers that treatments are not automatically required when low numbers of a "pest" species are found.

Treatments

In domestic IPM programs, treatments generally fall into two categories: preventive measures and control measures.

Prevention

The long-term goal of managing any pest problem should be prevention. This includes:

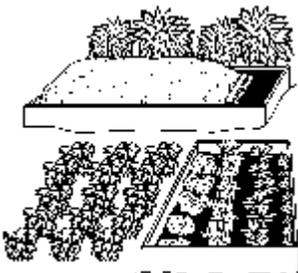
- planting pest resistant plants
- using barriers to keep pests out
- cleaning up to remove food for pests
- cultural practices that ensure healthy plants
- changes to the environment to make it less hospitable to pests

For example, lawns can be managed to prevent weeds from growing by using good turf management practices. This includes such steps as mowing at the recommended height (not less than 6 cm for most home lawns), using slow release fertilizers and correct watering practices.

Selling Prevention

In addition to recommending pest resistant cultivars, there are a variety of products that dispensers can sell to customers to prevent pest problems. These include barriers, such as floating row covers, as well as other supplies, such as soil amendments and fertilizers, to grow healthy, pest resistant plants.

In homes and gardens, preventive methods alone are often sufficient to keep most pest populations at tolerable levels. These methods also make other controls more effective and help prevent the recurrence of problems.



Resistant Plantings: Gardeners can choose those plants that are least susceptible to attack by insects or disease. These may be naturally hardy and pest-free plants, such as many native plants, or they may be cultivars that have been selected for resistance.

Examples include:

- roses resistant to black spot, powdery mildew, and rust
- grapes, squash and cucumber resistant to powdery mildew (check descriptions in seed catalogues)
- rhododendrons resistant to black vine weevil

Barriers: Barriers keep pests away from plants. Although they may take time and effort to install, once in place they usually require no further effort.

Examples of barriers are:

- tar paper squares, laid around the base of cabbage plants to prevent root fly from laying eggs
- screens on doors and windows to keep out flies
- floating row covers over carrot beds to keep out carrot rust fly
- sticky bands on tree trunks to catch female winter moths and prevent them from laying eggs on trees

Sanitation: Removing food and water sources and eliminating nesting and overwintering sites can be very effective in preventing pest problems. Common sanitation steps include:

- cleaning up spilled food in cupboards to remove food for pests
- keeping garbage tightly covered to discourage ants and rodents
- checking new plants (before buying) to make sure they are not diseased or infested with insects
- picking up and destroying early dropped fruits, which are often infested by insects

Cultural Practices: Also called cultural controls, these are measures that ensure that plants are healthy and well-suited to the site. This can make a big difference in how well plants grow, their susceptibility to diseases, and how quickly they recover from damage.

For example:

- select plants that are adapted to the conditions where they are to grow (soil type and drainage, shade or sun, exposure to wind or salt spray)
- use proper watering, fertilizing and other cultural practices

Changing the Environment: When conditions that favour pest populations are removed or changed it can go a long way toward discouraging pests. For example:

- aerating lawns to improve drainage deters the growth of moss and some species of weeds
- drying out structural wood that has become damp, through leaks or direct contact with the soil, prevents carpenter ants and dampwood termite infestations
- composting kitchen and garden wastes in rodent-proof bins reduces rodent populations

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Controls

Ideally, controls are only called for where preventive measures have not been sufficient.

Generally, controls for home and garden pests fit into four main types:

- physical controls
- mechanical controls
- biological controls
- chemical controls

These controls may be used separately or in combination for greater effectiveness. When deciding which controls to choose, consider those that are:

- least hazardous to human health
- least toxic to other non-target organisms (for example, pets, fish, and beneficial insects)
- least damaging to the environment
- most likely to provide a long-term solution
- most likely to be used correctly by the customer
- most cost-effective in the long run to the customer

Physical Controls

Physical controls include mulches, sticky insect traps and rodent traps as well as using hoeing or hand pulling to control weeds. Freezing dry food products to kill stored product pests would be a physical control, as would using boiling water to kill weed seedlings growing in sidewalk cracks.

Sticky traps for insects can be used both as a monitoring tool and as a physical control. It is possible to control whiteflies or fungus gnats on indoor plants if enough yellow sticky traps are placed among the plants.

Gardeners Beware! #2

Apple Maggot Traps: These sticky red ball traps work well to capture adult apple maggot flies, but so far, this species has not been found in BC. Although at times some garden centres have sold them, these traps are for a pest we don't have. Other insects get caught on the apple maggot traps, but since they aren't the target pest, there is no benefit to killing them.

Mechanical Controls

Mechanical controls are machines or equipment used to control pests. These include vacuum cleaners, ultra-violet light traps, cultivators for weeds, and string weeders.

Gardeners Beware! #3

Ultrasound Repellers: These are not legal to be sold in Canada for insect control, because they do not work on insects. Periodically, however, a mail order source or local supplier springs up to sell these devices to the unwary. There is evidence that rats and mice do hear ultrasound and are initially repelled by it, therefore the devices are registered for rodent control. However, research has also shown that rodents

eventually get used to the sound and are likely to return, especially if there is a food supply available. Using repellents for insects, such as fleas, cockroaches, mosquitoes, or flies, does not work because studies have found that these insects do not have the ability to hear ultrasound.

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Biological Controls

Biological control is the use of living organisms that are the natural enemies of pests to control pest populations. Many of these natural enemies are beneficial insects and mites, but they can also be animals, such as birds and snakes, or even micro-organisms, such as beneficial soil fungi and bacteria.



Home gardeners can employ biological controls by:

- protecting the many beneficial species that are native to BC
- buying beneficial species (insects or mites) from commercial suppliers

Protecting Native Beneficial Species: The most important way to protect beneficial species is to avoid using pesticides as much as possible, especially chemicals that affect a wide range of species or that are very long lasting.

If pesticides are needed as part of a pest management program, then the user should:

- select products with the lowest toxicity, such as insecticidal soap, and/or shortest residual effect, such as pyrethrins
- limit the applications to only those plants or areas that are infested

Native beneficial insects can be attracted to home gardens by growing plants that provide them with pollen and nectar. Many adult female beneficial insects must have nectar or pollen to give them energy to lay eggs. Once the females are attracted to the garden, they are likely to stay and lay eggs. When the eggs hatch, the larvae that emerge prey on the pests. Recommended plants are those with small flowers, such as dill, parsley (a biennial), catnip, lemon balm, thyme, and other herbs, which provide food for tiny parasitic wasps. Daisies, coneflowers, and yarrow are good pollen sources for lady beetles and other predators. Alyssum, candytuft, marigolds, phacelia, schizanthus, and salvias are also good insect plants, as are some common weeds, such as dandelions, goldenrod, wild carrot, lamb's quarters, and wild mustard.

Using Commercial Beneficial Species: Beneficial species sold by commercial suppliers include micro-organisms, insects, mites, and nematodes. The main micro-organism currently available to gardeners is *Bacillus thuringiensis* (Kurstaki) or BTK (such microbial products are legally registered as pesticides).

Most species of beneficial insects and mites are sold for use in commercial greenhouses. Many of these are also effective in hobby greenhouses, but only some of them are recommended for use outdoors.

Customers interested in using beneficial species should be aware that:

- most only attack particular species of pests, therefore the problem must be correctly identified first
- supplier instructions must be followed very carefully to ensure good results
- these living organisms are very perishable and must be handled carefully and released promptly

Lady Beetles: Everyone has seen packages of lady beetles for sale in some garden centres. Most are the species *Hippodamia convergens* sold to control aphids. These are collected in California in the fall from large congregations of lady beetles that gather together to hibernate. When the beetles are released into a garden in the spring most of them fly away, even when there are aphids to eat, because their instinct is to disperse. You can temporarily stop the beetles from flying away by spraying them with clear soft drinks (such as 7-UP). The sweet liquid glues their wings together without harming them. This step may keep them around long enough to mate and lay eggs so that their offspring stay to control aphids.

Also consider there are many native lady beetle species already present in BC and these cost nothing to provide aphid control. Lady beetles are being scooped up out of their home range in large numbers to sell. Harvesting lady beetles is not an ecologically sound practice and may not continue indefinitely.

Recently, some garden centres have been stocking the multicoloured Asian lady beetle, *Harmonia axyridis*. These are less likely to fly away when released, but because they are becoming an increasingly common species in many areas of southern BC, it is likely they are already in many gardens.

Table 1. Biological Controls for Home Gardens and Greenhouses

Pest Problem	For Outdoor Gardens
Aphids	Aphid midge (<i>Aphidoletes aphidimyza</i>) Multicoloured Asian lady beetle (<i>Harmonia axyridis</i>)
Spider Mites	Predatory mites (<i>Amblyseius fallacis</i>) (also various other species)
Root Weevil Larvae and Leatherjackets	Insect parasitic nematodes (<i>Steinernema</i> and other species)
	For Greenhouse Plants
Aphids	Aphid midge, multicoloured Asian lady beetle. Aphid parasite (<i>Aphidius matricariae</i>) Convergent lady beetle (<i>Hippodamia convergens</i>)
Spider Mites	Predatory mite (<i>Phytoseiulus persimilis</i>)
Whiteflies	Greenhouse whitefly parasite (<i>Encarsia formosa</i>) Predatory beetle (<i>Delphastus pusillus</i>)
Mealybugs	Australian lady beetle (<i>Cryptolaemus montrouzieri</i>)
Scale, Soft Brown	Predatory beetles (<i>Lindorus lophanthae</i>) (rarely available)

Gardeners Beware! #4

Praying Mantid Egg Cases: Adult mantids are large insects capable of eating many insects. Egg cases are sold in stores, but they are rarely still alive when they are finally taken home. If the eggs do hatch, the tiny mantids often die immediately if sufficient prey is not immediately available. Those that survive eat anything, including many beneficial insects and butterflies. Although a fascinating pet to keep in a terrarium, mantids are not recommended for release outdoors in British Columbia.

Chemical Controls

A huge variety of substances, mostly chemicals, are registered as pesticides in Canada. Pesticides are any substances that are used to kill, control, repel, or manage insects, rodents, fungi, weeds and other living things that are considered to be pests. Pesticides vary greatly in their toxicity and the way they work (see [Chapter 2](#)).

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Problems with Pesticide Use

Much of the increasing interest in IPM stems from the undesirable side effects of pesticide use, including:

- development of pest populations that are resistant to pesticides
- exposure of people, pets and other non-target organisms to potential health hazards
- environmental contamination by pesticides

In comparison to other types of controls used in IPM programs, pesticides can:

- provide short-term control, but rarely a long-lasting solution to pest problems
- require careful planning to ensure proper storage of chemicals around homes
- create a waste disposal problem for the more toxic chemicals

When pesticides are necessary in a pest management program, the customer should have help in choosing the most appropriate pesticide and method of application. Pesticides should only be considered after careful assessment indicates their use is required, based on all the available information.

There are several approaches the dispenser can recommend to limit negative impacts of pesticides, such as:

- choose "preferred pesticides" where possible
- choose ready-to-use formulations, rather than concentrates
- choose application methods that limit the amount of pesticide used

- limit treatments to only the plants or site where pests are a problem
- notify anyone who could enter a treated area to prevent exposure to pesticides

Preferred Pesticides

Preferred pesticides as described in this manual generally are those that:

- present the least short and long-term health risk to humans
- have the lowest environmental impact, due to the short residual effects and/or their specificity to target pests

The characteristics of specific preferred pesticides are described in Chapters [7](#), [8](#), and [9](#) of this manual.

Other Pesticides

Products containing toxic and/or persistent chemicals, such as organophosphorous and carbamate insecticides, are registered for use around homes and gardens. These may be necessary in some cases, particularly as a short-term measure to deal with an immediate pest problem. Generally, however, these products should not be recommended to home and garden users when preferred pesticides are available. This is because of the risk of harming non-target organisms and the hazard associated with improper storage and disposal. Also, there is increasing concern that some of these chemicals disrupt hormone functions in humans and animals. These are known as endocrine disrupters.

For customers buying such products for larger areas, such as hobby farms, it is recommended that they obtain a pesticide applicator's certificate in the appropriate category (courses are offered by community colleges and other local trainers). It is essential that all customers planning to use such products know what safety equipment they need to use and that the pesticides must be used according to instructions on the label.

Characteristics of specific pesticides are discussed in Section II.

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Evaluation

This step in the IPM process is important because it helps people decide what worked for them and what didn't, so they can identify ways to improve their results. In particular, the customer should keep records of pesticides used and treatment dates. They should be encouraged to keep notes on the pest situation before they treat so that they can be compared with observations made after treatment. These notes will also help them in future years to decide whether or not treatments are necessary and when to take preventive steps.

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IPM: Role of Dispensers

Although the final responsibility for pesticide use is with the person applying the pesticide, the dispenser must be available to help choose products and advise on their use. The dispenser should:

- ensure the safe display and storage of pesticides at the sales area
- ensure customers know that pesticides should be used only according to the directions on the label
- be able to advise on pest prevention and management methods

Dispensers should be prepared to help customers make informed decisions about pest management, and should introduce them to IPM methods as the most effective way to achieve results. Dispensers should be able to direct their clients to non-chemical methods or recommend preferred pesticides (see Section III). The use of least toxic controls reduces the safety and environmental hazards associated with pesticides, and ensures there is less risk from storing pesticides around the home.

Most customers appreciate being told about safer control products. They also appreciate a dispenser that recommends only what a customer needs, based on a positive identification of a pest or problem. Vendors can profit from the sale of other pest management products besides pesticides, while at the same time improving customer relations by giving sound pest management advice. This will result in customers recognizing the vendor as an authority on pests and pest management, not just as a place to buy pesticides.

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STUDY QUESTIONS

Answers are provided [here](#).

1. For each statement in Column A, choose the best match from Column B.

Column A

___ sticky trap

___ barriers

___ Integrated Pest Management

___ preferred pesticides

___ pest identification

Column B

a. ineffective mechanical devices, not legal to sell in Canada for insects

b. mulching, hoeing or hand pulling weeds, rodent traps

c. regular visual inspections and written notes

d. prevention of pest problems and use of least toxic controls

2. What are the five components of an ideal IPM program?

3. Describe three ways to identify a pest.

4. What is the purpose of monitoring?
5. What is an injury level?
6. Why is prevention so important for home and garden pest problems?
7. What is biological control? Give one example of a beneficial species that would be useful in a home garden.
8. List three unwanted side effects of pesticide use.
9. What is a preferred pesticide? Give two examples.
10. What three things should the dispenser be able to do to help customers select products and use them correctly?

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