



**VENDOR/DISPENSER MODULE FOR  
COMMERCIAL AND RESTRICTED PRODUCTS**

**MODULE – VENTE DES PESTICIDES  
D'USAGE COMMERCIAL ET RESTREINT**

**BASIC KNOWLEDGE  
REQUIREMENTS FOR  
PESTICIDE EDUCATION  
IN CANADA**

**CONNAISSANCES  
FONDAMENTALES REQUISES  
POUR LA FORMATION  
SUR LES PESTICIDES  
AU CANADA**

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**Health  
Canada**

**Santé  
Canada**

# **VENDOR/DISPENSER MODULE FOR COMMERCIAL AND RESTRICTED PESTICIDES**

**BASIC KNOWLEDGE REQUIREMENTS**

**FOR**

**PESTICIDE EDUCATION IN CANADA**

**AUSSI DISPONIBLE EN FRANÇAIS**

**Prepared by the National Task Force on Pesticide Education,  
Training and Certification**

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# **BASIC KNOWLEDGE REQUIREMENTS FOR PESTICIDE EDUCATION IN CANADA VENDOR/DISPENSER MODULE FOR COMMERCIAL AND RESTRICTED PESTICIDES**

**The Vendor/Dispenser Module for Commercial and Restricted Pesticides contains the additional knowledge requirements for vendors/dispensers selling pesticides classified federally as Commercial or Restricted. The Vendor/Dispenser Core has been developed as the core knowledge requirements for pesticide education in Canada for pesticide vendors/dispensers selling pesticides. The vendors/dispensers selling pesticides that are classified federally as Domestic will only be required to know the information contained in the Vendor/Dispenser Core.**

**The documents are organized into ten concepts (subjects) and each concept is written in a three column format: Course Outline, Instructional Objectives, and Learning Outcomes. The Table of Contents in the module shows which concepts are expanded from the Vendor/Dispenser Core.**

**The Knowledge requirements in the Vendor/Dispenser Core and Vendor/Dispenser Module for Commercial and Restricted Pesticides are topics that should be covered by trainers or in a training manual for pesticide vendor/dispenser certification. It will also form the basis upon which the vendor/dispenser manuals are to be developed.**

# VENDOR/DISPENSER MODULE FOR COMMERCIAL AND RESTRICTED PESTICIDES

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**Concept: GENERAL INFORMATION**

**General Objective: To understand general information on pesticides (terms, naming pesticides, categorizing pesticides and formulations).**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

**Formulations**

Abbreviations are often used to indicate the type of formulation.

Common abbreviations are:

EC Emulsifiable concentrate

F Flowable

S Solution

D Dust

G Granular

P Pellet

SP Soluble Powder

DF Dry Flowable

WP Wettable Powder

Advantages of a few common formulations are:

D -ready to use;

DF -less dusty and easier to handle than WP;

EC -less agitation required, non-abrasive, less visible residue;

F -seldom clog nozzles;

G -no mixing required, ready to use, minimal drift;

P -easy to spot treat;

S -no agitation necessary;

SP -containers empty easily;

WP -easier to store in the cold.

Disadvantages of a few common formulations are:

D -dusty, drifts, leaves a visible residue on plants;

DF -requires agitation;

EC -phytotoxicity hazard maybe higher;

F -a.i. may settle out, requires moderate agitation;

P -often attractive to pets & children;

WP -dusty, requires agitation, can be abrasive, may leave visible residues.

Know the common abbreviations of pesticide formulations.

Know advantages and disadvantages of commonly used formulations.

Identify common abbreviations for pesticide formulations.

Identify advantages and disadvantages of commonly used formulations.



**Concept: GENERAL INFORMATION**

**General Objective: To understand general information on pesticides (terms, naming pesticides, categorizing pesticides and formulations).**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

Refer your customers to government publications to help them choose the formulation that will be effective but will minimize potential adverse effects.

Know where to refer your customer for information on choosing a formulation.

List where your customers can find information on choosing a formulation.

An adjuvant is a substance added to a pesticide mixture to enhance the pesticide's activity and qualities. Adjuvants work by:

- making the spray stick to the surface of the target better, increasing the penetration ability of the pesticide;
- improving spray droplet uniformity to give more complete coverage and controlling drift;
- altering the pH of the spray water;
- increasing/decreasing evaporation to improve the drying of the spray mixture.

Know what adjuvants are and how they improve the effectiveness of a pesticide.

Define adjuvant. Describe how adjuvants can improve the effectiveness of a pesticide.

Some types of adjuvants are:

Know common types of adjuvants.

List and describe the purpose of common types of adjuvants.

**Surfactants:** improve the spreading, dispersing, and/or wetting properties of a pesticide mixture. Wetting agents and spreaders are types of surfactants. Wetting agents allow wetttable powders and dry flowables to mix with water and stick on surfaces. Spreaders allow the pesticide to form a uniform coating layer over the treated surface.

**Stickers:** allow pesticide to stay on the treated surface.

**Thickeners:** reduce drift by increasing droplet size.

**Anti-foaming agents:** reduce foaming of spray mixtures.

**Buffers:** slow chemical breakdown of some pesticides by lowering the pH of alkaline water.

**Concept: GENERAL INFORMATION**

**General Objective: To understand general information on pesticides (terms, naming pesticides, categorizing pesticides and formulations).**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

**Drift retardants: reduce drift.**

**Compatibility**

Compatible pesticides are those that can be mixed together to control a wider range of pests with a single application. Not all pesticides are compatible. Pesticides that are not compatible can cause:

- loss of effectiveness;
- injury to treated plants or animals;
- settling out of solids creating a non-sprayable mixture.

Some combinations of pesticides are registered as "tank mixes", with clear use instructions on the labels and supporting data on physical compatibility, efficacy, safety and residues. It is preferable to use registered tank mixes where available.

Some pesticide labels state that the pesticide is "compatible" with other pesticides. While pesticides should certainly not be mixed together unless their compatibility is stated on the label, such statements are only indicators of physical compatibility. They do not guarantee that mixing will have no effects on the safety, efficacy or residues of the pesticides that are mixed.

Understand pesticide compatibility. Know that not all pesticides are compatible.

Know that pesticides can only be mixed together if this is stated on the label.

Describe pesticide compatibility. Identify problems that can occur if pesticides that are not compatible are mixed together.

Identify label statements for pesticide compatibility.

**Concept: HUMAN HEALTH**

**General Objective:** To understand acute and chronic toxicity; routes of exposure; factors affecting exposure; reducing exposure; and risk. To know poisoning symptoms and be able to recognize poisoning.

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

**Measuring Acute Toxicity**

The acute toxicity of a product is indicated on the pesticide label by precautionary symbols, words and statements.

Interpret the toxicity of a pesticide from the pesticide label.

Given a pesticide label, identify whether the pesticide is very, moderately, or slightly poisonous to people.

The acute toxicity of a pesticide is measured by the LD<sub>50</sub> or LC<sub>50</sub>.

Know how the acute toxicity of a pesticide is measured.

Describe how the acute toxicity of a pesticide is measured.

LD<sub>50</sub> stands for lethal dose 50. It is the amount (dose) that will kill 50% of test animals exposed to the pesticide. The smaller the number, the more toxic the pesticide. LD<sub>50</sub>s only estimate the toxicity of a pesticide to people. LD<sub>50</sub>s may exist for oral and dermal exposure routes.

Understand LD and LC<sub>50</sub>.

Describe LD<sub>50</sub>.

LC<sub>50</sub> stands for lethal concentration 50. It is the amount (concentration) of a pesticide in the air or water sufficient to kill half of the test animals exposed to the pesticide. The smaller the number, the more toxic the pesticide.

Describe LC<sub>50</sub>.

**Chemical Families**

Two chemical families that are most frequently the cause of pesticide poisonings are organophosphates, and carbamates.

Know the two chemical families which are most frequently the cause of poisoning symptoms.

List the chemical families that act on the nervous system.

Organophosphates and carbamates affect the nervous system by reducing cholinesterase levels in the blood.

Know that organophosphates and carbamates affect the cholinesterase level in the blood.

List the two chemical families that affect the cholinesterase level in the blood.

**Cholinesterase Testing**

Organophosphates and carbamates affect the nervous system by preventing signals from being transmitted from the brain to various parts of the body. This causes the muscles to twitch constantly resulting in convulsions or fits.

Know that organophosphates and carbamates affect the nervous system by preventing signals from being transmitted from the brain to other parts of the body.

Describe how organophosphates and carbamates affect the nervous system.

**Concept: HUMAN HEALTH**

**General Objective:** To understand acute and chronic toxicity; routes of exposure; factors affecting exposure; reducing exposure; and risk. To know poisoning symptoms and be able to recognize poisoning.

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

If someone has been poisoned by organophosphates or carbamates, the victim should be removed from the source of exposure and get medical help right away. Cholinesterase levels show the amount of poisoning.

Know what to do when a person has been poisoned by organophosphates or carbamates.

Describe what to do when someone is poisoned with organophosphates or carbamates.

Cholinesterase levels can be monitored by blood tests. Test the blood before exposure to establish a base level, then test regularly during the exposure period (every seven to ten days), and after exposure is completed. If the level is less than half of the base level, the person is showing signs of pesticide poisoning. Keep the person away from pesticides until the cholinesterase level returns to normal.

Know how to monitor cholinesterase levels.

Describe how to monitor the cholinesterase level in the blood.

Blood tests help a doctor diagnose the signs of pesticide poisoning, and warn the handler that more safety precautions should be taken when handling organophosphates and carbamates.

Know why cholinesterase blood tests should be taken.

Describe why it is important to have blood tests.

**Concept: PESTICIDE SAFETY - TRANSPORTATION**

**General Objective: To know how to transport pesticides safely and legally.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

**Transportation Rules**

Vendors should know the provincial and federal guidelines for transporting pesticides. No one shall transport potentially hazardous quantities of dangerous goods as defined under the Transportation of Dangerous Goods (TDG) Act unless they are properly trained and use the required shipping documents, special product labels, other safety marks, vehicle placards and certain safety procedures. There are no TDG Act requirements for a purchaser transporting a Domestic pesticide from the retail outlet to a residence.

The pesticide vendor must tell the customer transporting the pesticide if a pesticide is regulated as a dangerous good and must provide information required on shipping documents, vehicle placarding requirements or any other special requirements. This information should be obtained from the manufacturer or distributor. Transport Canada can provide additional information on transporting dangerous goods.

The vendor should make sure all employees handling a pesticide know the transport requirements for the product.

**Transportation Guidelines**

Always carry a shovel, an absorbent, and safety equipment in case of a spill.

Know the general requirements for transport of dangerous goods.

Know to carry clean up equipment, in case of a spill.

List general requirements for transport of dangerous goods.

Identify who should make sure customers handling a pesticide know the transport requirements for that product.

Describe what to carry for the clean up of spills.

**Concept: PESTICIDE SAFETY - STORAGE**

**General Objective: To know how to store pesticides safely and legally.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

**Storage Location**

The storage facility should be:

- separate from work area;
- away from wells, ditches or water bodies;
- away from areas often used by people (untrained people, children and animals should be kept away from the storage area);
- on non-permeable soil;
- away from areas where flooding may occur;
- accessible to emergency personnel after business hours.

Know the characteristics of the location of a good pesticide storage facility.

List characteristics of the location of a good pesticide storage facility.

**Storage Facility**

The storage facility should ideally:

- only be used for storing pesticides;
- be locked;
- have a warning sign on the entrance indicating that pesticides are stored in the facility. Signs should be posted to indicate flammable materials and a no smoking sign should be posted;
- be built in such a way that pesticides are protected against adverse weather conditions;
- be made of fire resistant materials (subject to provincial fire codes);
- have a floor that does not allow seepage (ideally with a curb to retain spills);
- be able to contain spills or contaminated water used in fire fighting;
- not have floor drains;
- be well-ventilated under all weather conditions;
- be well-lit;
- have shelves made of materials that do not absorb pesticides;

Know the characteristics of a good pesticide storage facility.

List characteristics of a good pesticide storage facility.

**Concept: PESTICIDE SAFETY - STORAGE**

**General Objective: To know how to store pesticides safely and legally.**

**COURSE OUTLINE**

- have adequate electrical wiring (explosion and fire hazard);
- have appropriate fire extinguishers outside the storage area.

**Temporary Pesticide Storage**

Most of the principles that apply to permanent pesticide storage should apply to temporary pesticide storage. Follow provincial requirements.

**Storage Guidelines**

- Never store pesticides with or near livestock, food, animal feed, seed, veterinary supplies, wells, water supplies, or in a home.
- Read and follow storage instructions on pesticide labels and MSDSs.
- Store pesticides in their original container/packaging with original labels.
- Store pesticides in a dry area. Check containers regularly for leaks, tears, rust or loose lids.
- Store the minimal amount of pesticides. Make careful estimates of customer demand.
- Never store pesticides in containers that were used for food, drink or medicines. Store in original labelled containers.
- Do not store containers in sunlight (fire hazard/may degrade).
- Flowables and suspensions settle out when stored for long periods of time. If the product has been stored for a long period of time, the container should be aggressively shaken prior to the sale.
- Keep an inventory of the quantity, type and age of the pesticides in storage. Keep this list up-to-date, handy, and away from the storage site.

**INSTRUCTIONAL OBJECTIVES**

Know how to store pesticides temporarily.

Know how to store pesticides safely.

**LEARNING OUTCOMES**

Describe how to temporarily store pesticides.

List guidelines for the safe storage of pesticides.

**Concept: PESTICIDE SAFETY - STORAGE**

**General Objective: To know how to store pesticides safely and legally.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

- Arrange pesticides in storage in a way so products are easily recognized and cross-contamination is prevented. If possible, store herbicides separately from insecticides and fungicides to prevent cross-contamination. Keep containers/packages upright and off the floor.
- Minimize the handling of pesticides.
- Return containers/packages to storage when not on display.
- Do not smoke in or around the storage area.
- Inform the local fire department of the location and contents of the storage facility.
- Keep appropriate protective clothing/equipment near (not in) the storage facility.
- Keep emergency response equipment near (not in) the storage facility. Keep clear access to emergency equipment at all times.
- Keep a list of emergency telephone numbers posted near the storage area. (fire dept., medical personnel, poison information centres).
- Protect pesticides from freezing (especially freezables) if stored over the winter.
- Follow all building, fire and electrical codes.
- Keep pesticides away from high traffic areas.
- Follow manufacturer's suggested stacking heights. Make sure that tiers are stable and secure.
- Keep flammable and combustible materials stored in a separate section of the warehouse, away from heating systems. Keep this area well-ventilated and free from any possible source of flame.
- Keep enough space between rows to permit visual inspection of containers for corrosion and leaks.
- Never refuse a shipment of damaged goods. Deal with the damaged pesticide.



**Concept: PESTICIDE SAFETY - STORAGE**

**General Objective: To know how to store pesticides safely and legally.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

- Keep Material Safety Data Sheets, technical bulletins, product labels and other information up-to-date and readily available to all employees. Keep the records away from the storage area but readily available.

**Guidelines for Bulk Storage**

Check all pumps, valves etc., located on the bulk storage containers on a regular basis and replace damaged or worn parts immediately.

Make sure all bulk storage tanks have dikes or retaining walls and an impervious base to collect all the pesticide in case of a spill.

Make sure all liquid transfer systems are designed to prevent overflow while filling operations are under way.

Have a system to contain and dispose of tank washings, pump washings, etc.

**Standards**

The Crop Protection Institute has implemented new standards for the storage of pesticides by vendors. Provincial regulations may have additional requirements.

Know the guidelines for the bulk storage of pesticides.

Know that the Crop Protection Institute has developed standards for the storage of pesticides.

List the guidelines for the bulk storage of pesticides.

Identify who has developed standards for the storage of pesticides.

**Concept: PESTICIDE SAFETY - PROTECTIVE CLOTHING AND EQUIPMENT**

**General Objective: To know how to select, correctly wear and maintain suitable clothing and equipment for the handling of pesticides.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

**Types of Respirators**

In addition to the respirators described in the core, the following may be used for handling commercial and restricted pesticides.

Canister respirators have a full face piece and a canister with a larger volume of charcoal than the 1/2 face mask. The larger volume cartridge allows their use in higher vapour concentrations than where cartridge respirators are used. Use a canister that provides protection from organic vapours.

Air-powered purifying respirators use an electric pump to draw air through a charcoal cartridge. The purified air is delivered to a tight-fitting face mask or a loose-fitting helmet. They are a comfortable option to the 1/2 mask/full mask respirator, especially on hot days when respiratory protection is needed for long periods of time.

Self-contained breathing equipment supplies air through a tube on the headpiece from a tank on the wearer's back. These respirators are used for the application of fumigants or for use in emergencies such as a fire in a pesticide storage area.

Know that canister respirators are used in higher vapour concentrations than cartridge respirators.

Know how air-powered purifying respirators work.  
Know when this respirator might be needed.

Know how self-contained breathing equipment works.  
Know when this equipment is used.

Identify where canister respirators should be used.

Describe how an air-powered purifying respirator works, and when it might be needed.

Describe how self-contained breathing equipment works and describe when it should be used.

**Concept: PESTICIDE SAFETY - PROTECTIVE CLOTHING AND EQUIPMENT**

**General Objective: To know how to select, correctly wear and maintain suitable clothing and equipment for the handling of pesticides.**

**COURSE OUTLINE**

Some tractor cabs are equipped with activated carbon cartridges, which remove chemicals from the air while spraying in the field. A cab without cartridges should be ventilated by keeping the door or window open when used for pesticide applications. Tractor cabs equipped with dust filters only, and/or air conditioners can concentrate airborne spray droplets inside the cab. If the tractor's blower unit is not fitted with an organic vapour cartridge, a respirator with an appropriate cartridge should be used, if it is recommended on the pesticide label.

**INSTRUCTIONAL OBJECTIVES**

Know what respiratory equipment should be used in a tractor cab.

**LEARNING OUTCOMES**

Describe activated carbon filters. Identify the respiratory equipment to use if the tractor cab does not have an activated carbon filter.

**Cleanup and Maintenance of Respirators**

- Inspect regularly for damage.
- Make sure all valves, pre-filters, and charcoal cartridges are properly positioned and sealed.
- Take off pre-filters and cartridges/canisters after each day of use and place in a clean sealed plastic bag. This prevents the cartridge from being used up when not in use. Wash the respirator face piece in warm water with mild detergent, then rinse well.
- Always start each year with new cartridges/canisters.
- Follow the manufacturer's instructions for replacing pre-filters and cartridges/canisters.
- Always replace cartridges/canisters if you smell the pesticide through the respirator.
- Keep charcoal cartridges/canisters in a clean air-tight container.

Know how to care for respirators used for protection during pesticide application.

Describe how to care for respirators.

**Concept: PESTICIDE SAFETY - PROTECTIVE CLOTHING AND EQUIPMENT**

**General Objective: To know how to select, correctly wear and maintain suitable clothing and equipment for the handling of pesticides.**

**Concept: PEST MANAGEMENT**

**General Objective: To understand pest management principles required to carry out safe effective pest control.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

**Pest Identification**

Correct pest identification is the key to good pest management. It helps in the choice of the correct pest control method and materials, and minimizes damage to beneficial organisms and the environment. Pest identification information is available from:

- government publications;
- pest control representatives (e.g., pest management firms, technicians, pesticide company sales/technical reps, etc.);
- government pest control specialists;
- universities and colleges.

**Pest & Host Life Cycle and Behaviour**

Refer customers to university, college, government and industry experts for further information.

**Monitoring**

Monitoring the pest, beneficial organisms, and environmental conditions provides the information for making pest management decisions. By monitoring the pest, controls can be used only if and when needed, and at a time when the control will be most effective.

The number of pests beyond which will cause an unacceptable amount of damage (health, aesthetics, or economics) is called the threshold level. The threshold level varies with each type of pest and host. Pests should be managed so the pest populations are reduced to below the threshold level.

Know why correct pest identification is important.

Know where to obtain advice or information on pest identification.

Understand the advantages of monitoring.

Understand threshold levels.

Describe why it is important to correctly identify pests.

List places where information on advice on pest identification can be obtained.

Identify why it is important to monitor pests.

Describe threshold levels.

**Concept: PEST MANAGEMENT**

**General Objective: To understand pest management principles required to carry out safe effective pest control.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

Advise your customers that information on monitoring and threshold levels may be available in government publications; from pest control specialists; or from universities or colleges.

Know where information on monitoring and threshold levels may be available.

List sources of information on monitoring and threshold levels.

**Management Methods**

There are many ways to manage pests. Types of pest management methods are:

**Legal methods** - laws may limit the development of pest populations by restricting human activities.

**Cultural methods** - routine management practices that can prevent pests from developing or spreading. They may disrupt the pest or host, or make the environment less favourable for survival of the pest.

**Mechanical methods** - involve the use of devices to prevent the spread of pests or reduce pest populations. Mechanical methods include destroying, trapping, putting up screens, nets or fences.

**Biological methods** - involve the use of organisms to control/kill the pest.

**Genetic methods** - involve the protection of the host and/or control of the pest by using organisms with special genetic traits (e.g., resistance to disease).

**Chemical methods** - pesticides (natural or synthetic) are used to kill, attract, repel, or control the growth of pests.

Advise the customer that specific information about management methods for different pests is available through extension specialists, government publications, colleges and universities.

Know different pest management methods.

List pest management methods.

**Concept: PEST MANAGEMENT**

**General Objective: To understand pest management principles required to carry out safe effective pest control.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

If the applicator has chosen chemical control, the following are some terms which must be understood.

Selective pesticides are toxic to some pests, but have little or no effect on other similar pests (or beneficial insects).

Non-selective pesticides are toxic to a wide range of pests as well as non-target organisms.

Residual pesticides continue to be effective on a treated surface or in the treated area for an extended period following application (long-term control).

Persistent pesticides are those that remain active in the environment for a long time. Sometimes they may accumulate in animal or plant tissues.

Nonpersistent pesticides do not remain active in the environment for more than one year.

Pests can develop resistance to pesticides. Resistant pests are not injured or affected by a certain dosage of a pesticide but would normally be controlled.

After a pest population develops resistance to a pesticide or pesticide family it is very difficult and sometimes impossible to control the pest with products in that pesticide family. If pest resistance is suspected, advise customers to contact an extension specialist.

**Environmental Conditions**

Environmental conditions can affect the effectiveness of the control method, and its safety (environmental and human).

Knowhow to classify pesticides according to selectivity.

Understand the term residual pesticides.

Know how to classify pesticides according to persistence.

Understand the term resistant pests.

Know why it is important to slow the development of pesticide resistance in pests.

Understand that environmental conditions at or near the treatment site can affect the effectiveness of the control method.

Describe selective and non-selective pesticides.

Describe what a residual pesticide is.

Describe persistent and non-persistent pesticides.

Describe what resistant pests are.

Identify why it is important to slow the development of pesticide resistance in pests.

List environmental conditions that could affect pest management decisions.

**Concept: PEST MANAGEMENT**

**General Objective: To understand pest management principles required to carry out safe effective pest control.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

**Environmental conditions can include:**

- temperature;
- relative humidity;
- precipitation;
- air movement;
- nearby sensitive areas;
- topography.



**Concept: PEST MANAGEMENT - WEEDS**

**General Objective: To understand pest management principles required to carry out safe effective pest control.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

Check pesticide labels for precautions on specific environmental conditions related to a product.

A weed is a plant growing where it is not wanted.

Weeds are pests when they compete with cultivated plants for light, water and nutrients; reduce crop yields; harm people or livestock; contaminate foods; are alternate hosts for other pests; reduce visibility along transportation corridors; are aesthetically unpleasing; or affect structures or equipment.

**Types of Weeds**

Weeds are usually classified according to how long they live.

Annual weeds complete their life cycle within one year. Most annuals produce many seeds to ensure their survival. Annuals can be divided into two groups; summer annuals, which germinate in the spring, and winter annuals, which germinate in the fall.

Biennial weeds live more than one year but less than two years. They grow from seed, which usually germinates in the spring. The first year they store food, usually in short fleshy roots. Usually the foliage is only a rosette of leaves. Next season the plant uses the stored food and grows vigorously. It produces seed in the summer or fall and then dies.

Know what a weed is.

Know when weeds are pests.

Know the weed classifications according to how long the weed lives.

Define a weed.

List examples of when weeds are pests.

Describe annual weeds, biennial weeds and perennial weeds.

**Concept: PEST MANAGEMENT - WEEDS**

**General Objective: To understand pest management principles required to carry out safe effective pest control.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

Perennial weeds are plants that live more than two years. Often no seed is produced the first year; thereafter seeds can occur every year for the life of the plant. Almost all perennial weeds spread by seed. Many also spread by other plant parts such as creeping stems, stolons, creeping roots, rhizomes (a root-like underground stem), underground bulbs or a broken piece of root. There are shallow-rooted and deep-rooted perennials.

**Weed Identification**

Weeds should be identified to determine the best weed control methods. Advise the applicator to obtain assistance from weed control specialists.

Know that weeds should be identified.

Identify where to find assistance in weed identification.

**Identifying Leaf Stages**

Knowing how to identify desirable plant (e.g., crop, turf) and weed leaf stages is important because some herbicide labels refer to weed and crop leaf stages for timing of application.

Appreciate why it is important to know how to identify leaf stages of desirable plants and weeds.

Identify why it is important to recognize leaf stages of desirable plants and weeds.

Often herbicides are only effective when desirable plants and weeds are at certain stages of growth. There might not be enough leaf area for efficacy if herbicides are applied too early; if applied too late, weed control may not be achieved or desirable plants could be damaged.

Weed sizes and leaf numbers change rapidly. Herbicides must not be applied past the stage when they will be effective. Avoid this by regularly monitoring the growth of weeds and surrounding plants. Advise the applicator to obtain assistance from weed control specialists to identify leaf stages.

**Concept: PEST MANAGEMENT - WEEDS**

**General Objective: To understand pest management principles required to carry out safe effective pest control.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

**Weed Management Methods**

A combination of weed management methods can be used. Below are some examples of pest management methods using weed control examples.

Be able to apply weed management methods to a weed situation.

List the factors to consider when helping a customer plan a weed control program.

Cultural control emphasizes competition to discourage weeds and includes:

Know weed management methods.

List and describe examples of weed management methods.

- nurse or companion crops; a fast-growing crop planted along with a slower growing crop to compete with the weeds and can be mowed when the slower crop is established;
- increasing the plant's ability to compete against weeds by using good cultural practices (e.g., optimum fertilizer rates, watering, etc.)

Mechanical (Physical) control disrupts weeds and includes:

- cutting weedy tops prior to weed seed production;
- tillage and hand weeding;
- mowing, burning, other sanitation practices;
- using mulch to suppress seed germination.

Biological control includes:

- grazing a field prior to weeds going to seed;
- releasing pest-specific insects or other natural agents.

Advise your customer to obtain assistance on weed management methods from an extension specialist.

**Types of Herbicides**

Herbicides are classified according to selectivity, mode of action, timing of application and residual effectiveness.

Know the ways herbicides are classified.

List the ways herbicides may be classified.

Selectivity - Selective herbicides only kill or damage certain plants; non-selective herbicides kill or damage all plants in a treated area.

Know how to classify herbicides according to selectivity.

Describe selective and non-selective herbicides.

**Concept: PEST MANAGEMENT - WEEDS**

**General Objective: To understand pest management principles required to carry out safe effective pest control.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

**Mode of Action - Mode of Action explains how the herbicide kills a plant.**

**Understand mode of action.**

**Define and describe mode of action.**

**Contact herbicides kill plant parts contacted by the herbicide. There is little or no movement of the herbicide in the plant. Contact herbicides are effective against annual weeds but they only "burn off" the tops of perennial weeds.**

**Systemic herbicides enter the roots or above ground parts of plants. These herbicides move or are translocated in the plant. Effects may not show for a week or more after treatment. Too much herbicide on the leaves may kill the leaf cells too quickly and prevent translocation to the site of action in a plant.**

**Timing of Application. Herbicides are applied at different stages of crop or weed growth.**

**Preplant. The herbicide is applied to the soil before seeding or transplanting. Preplant treatments are usually incorporated into the soil. These are called preplant soil-incorporated treatments.**

**Understand what the terms preplant, pre-emergence, and post-emergence means.**

**Define and describe preplant, pre-emergence and post-emergence herbicides.**

**Pre-emergence. The herbicide is applied to the soil after planting but before the emergence of the specified crop or weed. Pre-emergence may refer to the germination of either the weed or the crop; check the pesticide label for instructions on specific herbicides. Pre-emergence herbicides control weeds before or soon after they emerge.**

**Post-emergence. The herbicide is applied after the specified crop or weed has emerged. The application may be soon after emergence or up to a specific height or leaf number. Post-emergence herbicides control established weeds.**

**Residual effectiveness. Herbicides may remain effective after application.**

**Concept: PEST MANAGEMENT - WEEDS**

**General Objective: To understand pest management principles required to carry out safe effective pest control.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

**Non-residual herbicides are quickly inactivated in the soil after application and do not affect future crops.**

**Know what the terms residual herbicide, non-residual herbicide and soil sterilant mean.**

**Define non-residual herbicide.**

**Residual herbicides do not break down quickly and may control weeds for several weeks to several years.**

**Define residual herbicide.**

**Soil sterilants are non-selective residual herbicides which are applied to soil to prevent growth of plants for a long period of time (a few months to many years).**

**Define soil sterilant.**

**Concept: PEST MANAGEMENT - PLANT GROWTH REGULATORS**

**General Objective: To understand the use of plant growth regulators.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

**Plant Growth Regulators**

Plant Growth Regulators are used to change (speed up, stop, slow down) the vegetative or reproductive growth of plants.

Know why plant growth regulators are used.

Describe why plant growth regulators are used.

**Concept: PEST MANAGEMENT - INSECTS, MITES, SLUGS AND SNAILS (MOLLUSCS)**

**General Objective: To understand pest management principles required to carry out safe and effective insect, mite and mollusc control.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

Insects are a group of animals that have three body sections: 1 pair of antennae, 3 sets of legs and an outer skeleton.

Know the general description of an insect and a mite.

Describe what an insect is.

Mites are a group of animals that have two body sections, no antennae, 4 pairs of legs and an outer skeleton.

Describe what a mite is.

There are many different insects and mites. Only a few are pests when they damage property, crops, food, feed, livestock; and when they carry diseases affecting man or animals.

Know which insects or mites are pests in your province.

Identify the insects and mites which are pests in your province.

**Insect and Mite Life Cycles**

Insects and mites change as they grow; they go through 3 or 4 different stages. The common stages are: egg, nymph, larva, pupa, and adult.

Know the stages of growth that insects and mites go through.

List and describe the stages that different insects and mites may go through.

Pest control is specific to the stage of growth. The best control is usually achieved during the early stages (young, nymph, or larva). Eggs and pupa are not affected by most insecticides and miticides. For more information on life cycles, advise the applicator to refer to extension specialists.

Know the stages of growth during which the best control is usually achieved.

Identify when the best control is usually achieved in the life cycle.

**Insect and Mite Management Methods**

A combination of insect/mite management methods can be used.

**Types of Insecticides and Miticides**

Insecticides and miticides are often classified according to their selectivity, mode of action, and residual effectiveness.

Selectivity - Selective pesticides only control certain insects or mites and generally do not harm non target organisms. Non-selective pesticides may control all insects or mites or both in a treatment area.

Knowhow to classify pesticides according to selectivity.

Describe selective and non-selective pesticides.

**Concept: PEST MANAGEMENT - INSECTS, MITES, SLUGS AND SNAILS (MOLLUSCS)**

**General Objective: To understand pest management principles required to carry out safe and effective insect, mite and mollusc control.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

**Mode of Action - Mode of Action explains how the pesticide controls the pest.**

**Contact pesticides must come in contact with the pest to be effective. They can be applied to the pest or to the surfaces pest touch. Some contact insecticides have a residual effect and can kill the pest for some time after application.**

**Systemic pesticides enter plants or animals and flow in the sap or blood. Pests which suck the sap or blood are killed by the pesticide in it. Some pesticides are both systemic and contact.**

**Stomach poisons must be swallowed by the pests to be effective. They are usually applied to the pests food and taken in with the food. Sometimes stomach poisons are mixed with food to form a poisonous bait.**

**Suffocating pesticides (oils or soaps) clog the breathing system and can also affect egg survival.**

**Fumigants are pesticides that work in a gaseous form. The pests breathe the poisonous fumes. Fumigants are often used to kill pests in enclosed spaces or in soil.**

**Growth regulators act like the insect's own growth hormones. They disrupt the normal development of the insect and it dies before it becomes an adult or before it can reproduce.**

**Silica dusts or gels are inert powders that kill crawling pests by abrading their bodies. This causes them to drop and die. Contact insecticides are sometimes mixed with these powders.**

**Attractants are pesticides that may attract female insects for egg laying or attract male insects to artificial female traps.**

**Know how contact pesticides work.**

**Know how systemic pesticides work.**

**Know how stomach pesticides work.**

**Know how suffocating pesticides work.**

**Know how fumigants work.**

**Know how growth regulators work.**

**Know how silica dusts and gels work.**

**Know how attractants work.**

**Explain how contact insecticides work.**

**Describe how systemic insecticides work.**

**Describe how stomach poisons work.**

**Describe how suffocating insecticides work.**

**Describe how fumigants work. State whether an insecticide can work in more than one way (e.g., contact and fumigant action).**

**Describe how insecticide growth regulators work.**

**Describe how silica dusts and gels work.**

**Describe how attractants work.**



**Concept: PEST MANAGEMENT - INSECTS, MITES, SLUGS AND SNAILS (MOLLUSCS)**

**General Objective: To understand pest management principles required to carry out safe and effective insect, mite and mollusc control.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

Repellents are pesticides that repel insects and will therefore keep them away from their hosts. They are used against mosquitoes and other biting flies.

Know how repellents work.

Describe how repellents work.

Sticky pastes are placed on traps that attract pests. Attractants or colours are used to attract the insects to the trap. Once trapped the pest will not cause damage. Sticky pastes are also used as barriers to restrict the movement of crawling pests or to determine insect populations.

Know how sticky pastes work.

Describe how stick pastes work.

Microbial insecticides, i.e., *Bacillus thuringiensis*, contain microbes (tiny organisms). After they are eaten, the microbe or a poison the microbe produces kills the insects. They are sprayed on plants and are only poisonous to certain insects.

Know how microbial insecticides work.

Describe how microbial insecticides work.

Residual Effectiveness - some pesticides have a short residual period of effectiveness of one or two days, and other have a long residual period of effectiveness of several weeks or more. Residual insecticides control the insects/mites for a longer period of time.

Know what residual effectiveness refers to.

Describe residual effectiveness.

**Slugs and Snails (molluscs)**

Slugs and snails are soft bodied animals. They reproduce by laying eggs.

Know about slugs and snails.

Describe how slugs and snails multiply.

They are pests when they damage plants, feed on food; and when they carry diseases affecting man or animals.

Know when slugs and snails are pests.

Identify when slugs and snails are pests.

Molluscicides are used to kill slugs and snails. They are both attractive and poisonous to the pests. The pest is first attracted to the molluscicide by odour and then dies after eating the toxic substances. Molluscicides must not be accessible to children, pets, birds, or animals as they are quite toxic.

Understand how molluscicides work and their danger to others.

Describe how to control slugs and snails. Identify the danger to nontargets.

**Concept: PEST MANAGEMENT - DISEASES**

**General Objective: To understand pest management principles required to carry out safe and effective disease control.**

**COURSE OUTLINE**

Disease symptoms are caused by environmental stress, herbicide damage, insect damage, and/or microorganism infections (e.g., fungi, bacteria, virus, etc.). It is important to correctly identify the cause of the symptoms so that an effective treatment can be chosen.

**Causes**

**Environmental stress.** Unfavourable environmental conditions, which stress plants and cause abnormal growth or disease-like symptoms, include extremes of light, temperature, water or nutrients and toxic chemicals (e.g., air pollutants). Plants weakened by environmental stress are more likely to be infested by pests. Recognizing and relieving the stress will help prevent infectious diseases.

**Herbicide damages** usually occur over large areas (treated areas), injuring and/or killing wanted and unwanted vegetation.

**Insect damages** are isolated areas damaged by insects eating, or sucking, causing undesirable changes.

**Pest infection.** Micro organisms can cause diseases. Pest micro organisms include fungi, bacteria, viruses and nematodes. These organisms are usually too small to see. Identification is usually based on visual symptoms or on pest identification.

**Micro organisms** are pests when they damage desirable plants.

**Fungi** are the largest group of organisms that cause plant diseases. They are organisms which feed on living or decaying tissue. This group includes moulds, mushrooms, and rusts.

**INSTRUCTIONAL OBJECTIVES**

**Know** what can cause disease symptoms.

**Appreciate** why it is important to correctly identify the cause of disease symptoms.

**Know** that environmental conditions can stress plants and cause abnormal growth or disease-like symptoms.

**Know** the different characteristics between herbicide and insect damage.

**Know** the pest organisms which can cause diseases.

**Know** when micro organisms are pests.

**Know** about fungi that cause plant diseases.

**LEARNING OUTCOMES**

**List** the major causes of disease symptoms.

**Describe** why it is important to correctly identify the cause of disease or disease-like symptoms.

**List** the environmental conditions that could stress plants and cause abnormal growth or disease-like symptoms.

**Describe** the difference between herbicide and insect damages.

**List** the types of organisms that can cause diseases.

**Describe** when micro organisms are pests.

**Describe** what a fungus is.

**List** organisms that are considered fungi.

**Concept: PEST MANAGEMENT - DISEASES**

**General Objective: To understand pest management principles required to carry out safe and effective disease control.**

**COURSE OUTLINE**

Most fungi reproduce by tiny spores. The spores are released into the environment and are usually moved by wind or water. Some may land on a host plant. If environmental conditions are good, the fungus spores germinate. When spores germinate, they usually produce threadlike filaments which can infect the host, absorb nutrients, and give off toxins that cause disease symptoms. Movement of infected plants, plant parts and soil may spread fungus.

The fungus is most vulnerable to fungicides between germination and infection. Infection begins when the fungus is able to enter the plant tissues. When the plant responds to infection by growing abnormally it is said to be diseased. Inside the plant the fungus is protected and difficult to control. A systemic fungicide may control the disease if applied before the infection is too severe. Some fungi (e.g., rusts) need 2 different hosts to survive and reproduce.

Some symptoms that may be caused by fungi include cankers, dieback, galls, leaf spots, rots, rusts and wilts.

Bacteria cause some major plant diseases. Bacteria are one celled organisms that can only be seen with a microscope. They usually enter a plant through natural openings or wounds. Under favourable conditions, bacteria reproduce very quickly, using the plant as a source of food.

Bacteria are spread by wind and rain, ground or surface water, or by contact with contaminated animals or equipment.

Some blights, galls and rots are caused by bacteria.

Viruses are extremely small. They cannot be seen with an ordinary microscope. Viruses cause diseases that often reduce plant vigour and crop yields.

**INSTRUCTIONAL OBJECTIVES**

Know about bacteria.

Know about viruses.

**LEARNING OUTCOMES**

Describe how fungi reproduce and cause disease symptoms.

List symptoms of a disease that could be caused by a fungus.

Describe what bacteria is.

List ways bacteria could be spread.

List symptoms that could be caused by bacteria.

Describe what a virus is.

**Concept: PEST MANAGEMENT - DISEASES**

**General Objective: To understand pest management principles required to carry out safe and effective disease control.**

**COURSE OUTLINE**

Viruses reproduce only when they are in living cells. Viruses can be spread by mechanical means (e.g., during pruning or harvesting), in propagation material (seeds, tubers and other plant parts) or by vectors (insects, mites, nematodes, fungi).

Mosaics, ringspot and leaf roll are examples of diseases caused by viruses.

No pesticides are available to control viruses directly. However, some pesticides may be used to control virus vectors.

Nematodes are small worm-like organisms that may feed on plant roots, stems, and leaves. They can affect the movement of water and nutrients in a plant and they create wounds which may allow fungi or bacteria to enter.

Nematodes multiply by producing eggs.

Nematodes spread by movement of infected plants, animals, and seeds; and contaminated soil and water.

Some symptoms that can be caused by nematodes are wilting, stunting, lack of vigour, and growth deformities.

**Disease Management Methods**

Three conditions must be present for a pathogenic disease to develop. They are:

1. a disease-causing organism (pathogen);
2. a host susceptible to the disease;
3. an environment favourable to the disease organism and/or unfavourable to the host.

**INSTRUCTIONAL OBJECTIVES**

Know about nematodes.

Know the three conditions necessary for a disease to develop.

**LEARNING OUTCOMES**

List ways viruses can be spread.

List types of diseases caused by viruses.

Identify whether pesticides can be used to control viruses.

Describe what nematodes are.

Describe how nematodes reproduce.

Describe how nematodes spread.

List symptoms that may be caused by nematodes.

List the three conditions necessary for a disease to develop.

**Concept: PEST MANAGEMENT - DISEASES**

**General Objective: To understand pest management principles required to carry out safe and effective disease control.**

**COURSE OUTLINE**

Taking away or changing any one of these three conditions will control the disease. For example, a disease problem can be prevented by keeping the organism out of an area, using strains of plants that are resistant to, or are not affected by the disease, reducing the population of disease causing organisms, or by manipulating the environment to favour the host but not the pathogen.

Chemical control of disease-causing organisms can involve the use of fungicides, bactericides and nematicides. For more information, refer your customers to extension specialists.

**Types of Fungicides**

Fungicides are often described according to how they work (mode of action).

Protectant fungicides provide a protective film of fungicide on or around the host to prevent fungus spores from germinating. Protectant fungicides must be used before the fungi reach the infectious stage. After the plant is infected the fungicide normally will not kill the fungi inside the plant but it can protect the plant from more infection. New plant growth, which appears after treatment, is not protected. Therefore reapplication is required. Protection can be applied to seeds, foliage, flowers, fruit or to roots.

Eradicant fungicides kill fungus organisms that have already infected the plant, but have not become well established within the plant. Eradicant fungicides have limited value for fungi which are well established within plants.

**INSTRUCTIONAL OBJECTIVES**

Understand how diseases can be controlled.

Know how fungicides work.

**LEARNING OUTCOMES**

Describe how diseases can be controlled.

Describe how protectant fungicides work.

Describe how eradicant fungicides work.

**Concept: PEST MANAGEMENT - DISEASES**

**General Objective: To understand pest management principles required to carry out safe and effective disease control.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

Systemic fungicides are absorbed by plants and move within them. They may act as protectants, eradicants, or both. Once inside the plant, systemics move to new areas of plant growth.

Describe how systemic fungicides work.

**Bactericides**

Bactericides are chemicals that are toxic to bacteria. They kill bacteria on contact and must be used before the bacteria infect a plant.

Know how bactericides work.

Describe how bactericides work.

**Nematicides**

Nematicides move through the soil as a gas or in soil water and depend on the presence of spaces between the soil particles for their movement. A few nematicides are applied as liquid or granular formulations and are not fumigants, e.g., oxamyl. They may act by direct contact with nematodes or systemically so that nematodes feeding on or in the plant acquire a lethal dose.

Know what pesticides are used for nematode control and how they work.

Describe nematicides and how they work.

**Fumigants**

Fumigants are chemicals, in the gaseous state, that move through the air spaces between soil particles in sufficient quantities to be lethal to a pest organism.

Know what a fumigant is.

Define a fumigant and describe how it works.

**Concept: PEST MANAGEMENT - VERTEBRATE PESTS**

**General Objective: To understand pest management principles required to carry out the safe and effective control of vertebrate pests.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

**Vertebrate pests include:**

- birds;
- rodents;
- rabbits;
- regional pests such as bats, wolves, raccoons, skunks, moose, etc.

**Know potential vertebrate pests.**

**List potential vertebrate pests.**

**Vertebrates are pests when they damage property, crops, feed, food or livestock; and when they carry diseases affecting man or animals or birds.**

**Know when vertebrates are pests.**

**Describe when vertebrates are pests.**

**Pest Behaviour & Biology**

**Advise your customers that they must know vertebrate pest behaviour and biology because it is important in determining the most effective control methods, the best time to implement the control and the best location for control (e.g., traps, repellents or poisoned baits). For more information, refer your customers to extension specialists.**

**Understand why it is important to know about the behaviour and biology of vertebrate pests.**

**Describe the behaviour and biology of vertebrate pests.**

**Vertebrate Pest Management Methods**

**Concept: PEST MANAGEMENT - VERTEBRATE PESTS**

**General Objective: To understand pest management principles required to carry out the safe and effective control of vertebrate pests.**

**COURSE OUTLINE**

Vertebrate pests may be managed/controlled by:

- excluding them from a feeding or breeding location;
- destroying or changing their habitat;
- encouraging natural predators;
- frightening away;
- repelling them;
- shooting them;
- trapping them;
- poisoning them with pesticides (e.g., avicides, rodenticides);
- preventing pest reproduction with chemosterilants.

**INSTRUCTIONAL OBJECTIVES**

Know methods of managing or controlling vertebrate pests.

**LEARNING OUTCOMES**

List methods of managing or controlling vertebrate pests.

**Legal Status of Control Methods**

Legislation for the protection of wildlife may prevent the destruction of some pests or may require special permits for their control. Shooting, trapping and pesticides may be limited to specified times of the year or specified locations.

Check with provincial authorities about laws that could affect vertebrate control programs.

**Pesticides Used for Vertebrate Control**

Chemosterilants reduce bird populations by inhibiting reproduction.

Know how laws may affect the control of vertebrate pests.

Know who to ask regarding laws which may affect control programs for vertebrate pests.

Know the types of vertebrate control products and how they work.

Identify the laws that affect the control of vertebrate pests.

Identify who could tell you about laws that may affect proposed vertebrate control programs.

List and describe the types of vertebrate control products.



**Concept: PEST MANAGEMENT - VERTEBRATE PESTS**

**General Objective: To understand pest management principles required to carry out the safe and effective control of vertebrate pests.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

**Bird repellents may be non-poisonous or poisonous to birds. Non-poisonous repellents are put on exterior ledges, windowsills, beams and places where birds are not wanted. They are sticky and irritating to birds and therefore repel birds. Noise making devices, visual devices and glue-paste materials also act as repellents. Poisonous repellents, when eaten by birds, make the birds act strangely. The birds' strange behaviour repels other birds.**

**Acute rodenticides kills rodents after one feeding.**

**Anticoagulant rodenticides cause internal or external bleeding after they are eaten. They can be single-dose rodenticides and need one feeding or multiple-dose rodenticides and need several feedings over several days. Death occurs from external or internal bleeding. Cats and dogs are susceptible.**

**Fumigants are poisonous gases that kill rodents. They are used to kill burrowing rodents, gophers, and ground squirrels.**

**Pisicides are used to kill fish in bodies of water.**

**Animal repellents are used to keep animal pests away from plants, buildings or other treated areas.**

**Concept: EMERGENCY RESPONSE**

**General Objective: To know how to safely and effectively respond to pesticide emergencies.**

**COURSE OUTLINE**

**INSTRUCTIONAL OBJECTIVES**

**LEARNING OUTCOMES**

**Emergency Response Plan**

Be prepared to deal with an emergency by having an emergency response plan. An emergency response plan will:

- prevent an emergency from becoming a major disaster;
- protect the community;
- protect the business;
- protect the employees;
- reduce your liability for damages;
- keep environmental damage to a minimum;
- build confidence with neighbours.

An emergency response plan is a very important business document.

Include procedures for all types of emergencies. Kinds of emergencies include:

- fires;
- explosions;
- gas and odour release;
- spills;
- serious injury;
- natural disasters (lightning, tornado);
- threats (phone calls);
- transport accidents (highway and rail).

**Preparing the Emergency Response Plan**

Assign emergency co-ordinators. Give one person overall responsibility. Assign co-ordinators (available 24 hours) for specific duties, i.e., communications, site security, first aid, fire fighting, environmental control, plant operations. List alternates if a co-ordinator is not available.

Appreciate what an emergency response plan can do for a business.

Know the different kinds of emergencies that could occur.

Know to assign a person responsible for the emergency response plan and to assign emergency co-ordinators for specific duties.

Identify the purpose of an emergency response plan.

List the kinds of emergencies that could occur.

List the duties of emergency response co-ordinators.

**Concept: EMERGENCY RESPONSE**

**General Objective: To know how to safely and effectively respond to pesticide emergencies.**

**COURSE OUTLINE**

Make a list of the local people to call in case of an emergency, i.e., employees on site, manager, supervisors, fire department, police department, provincial authorities, neighbours, media, lawyer, insurance agency, other citizens. Keep a record of the call time, the name of the person reached, and what was said.

Make a list of emergency helpers from the community. Neighbouring businesses may be able to supply diking materials, heavy equipment, etc. Get a contact name and list the equipment they have available, 24 hours a day.

Map the warehouse and the surrounding area. Include buildings, docks, containments, waterways, sewers, drains, fencing, access routes, main shutoff for public utilities, etc.

Keep an accurate record of inventory. Include product name, PCP Act registration numbers, volume stored, and location. Keep product labels and MSDSs available for emergency information. Mark products having a high hazard. Keep the inventory separate from the storage area so that it is accessible during the emergency.

Have all the emergency equipment needed readily available and keep it in working condition, i.e., fire extinguishers, protective clothing and equipment, decontamination equipment.

Outline the emergency procedures in the step by step order that they need to be done. Name the person responsible for each task. Train employees and practice the plan.

File the plan with the employees responsible for the plan and local authorities. Update the plan, review it at least once a year, and keep employees informed of any changes.

**INSTRUCTIONAL OBJECTIVES**

Know to prepare an emergency response calling list.

Know to include a list of emergency helpers from the community in the emergency response plan.

Know to include a map of the business facility in the emergency response plan.

Know to keep an accurate record of pesticide inventory.

Know to have all the emergency equipment needed readily available and keep it in working condition.

Know to outline the procedures, train employees and practice the emergency response plan.

Know with whom to file the plan and know to keep it updated.

**LEARNING OUTCOMES**

List the local authorities who would need to be called when an emergency happens.

List the community helpers that might be on an emergency response calling list.

List the details that should be included on a map prepared for the emergency response plan.

List the information that should be included on the inventory record.

List the emergency equipment that should be kept on hand in case of an emergency.

Describe how emergency procedures should be outlined.

Identify with whom the emergency response plan should be filed. Identify how often it should be updated.