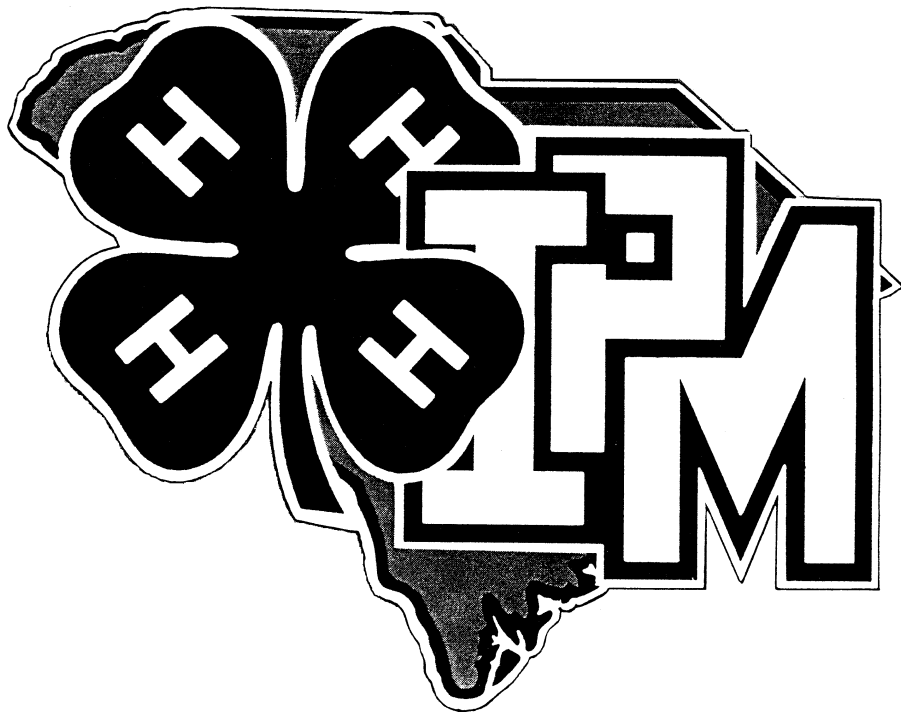


Pesticides in Your 4-H Project, Unit 2

4-H Manual 107
For Grade Levels 7-12
IPM Level E
February 2001



CLEMSON
E X T E N S I O N

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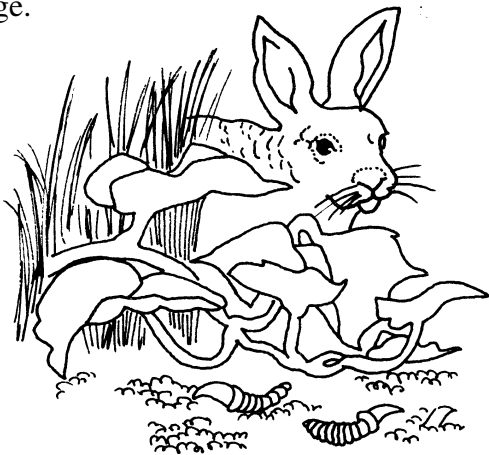
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PESTICIDES IN YOUR 4-H PROJECT

IPM

In the course of your 4-H project, your plants may be attacked by insects, disease organisms, and other pests. Weeds may rob your plants of the sunlight, air, and moisture needed for healthy growth, woodchucks or rabbits may eat your vegetables before they mature, and mice or rats may nibble away at your crops after harvest and storage.



There are several ways to combat these pests, but sometimes the proper use of a pesticide may mean the difference between success and failure of your project. If pest problems not covered in your 4-H project book arise, ask your club leader or county Extension agent for help. The insect, disease, weed, or rodent problem must be accurately identified before effective and safe control methods can be selected and used.

PESTICIDES CAN BE DANGEROUS

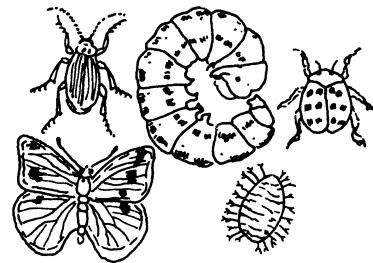
Because most pesticides are made to kill undesirable plant and animal organisms, these chemicals can be harmful to people, pets, birds, and wildlife if accidentally swallowed, inhaled, or touched. Pesticides range in classification from high toxicity-high hazard to very low toxicity-no hazard. **Toxicity** refers to that capacity of a chemical to cause injury. **Hazard** refers to the probability of injury resulting from its use.

Do not use any chemical in your project that is labeled with a skull and crossbones and has the word POISON printed on the container. These extremely poisonous pesticides are for use only by professional pest control specialists and experienced farmers. Although pesticides that have WARNING statements printed on the label are less dangerous, these are also too hazardous to use in your 4-H project.

You'll be on safe ground if you choose a less toxic pesticide requiring only a CAUTION statement printed on the label. Follow the directions for mixing, applying, and safe handling of these chemicals. Even the "caution" pesticides can be harmful if they are not handled carefully and used correctly.

WHY WE USE PESTICIDES

Plants in North America may be attacked by 3,000 different kinds of insects and about 50,000 different plant diseases. The destruction caused by these pests tends to increase as we grow more crops and plant the same crops more often in the same fields. Animals are also plagued by a wide variety of insects and disease organisms. Under most conditions, pesticides are the most efficient weapons for combating pests that deplete our food supplies.



Vegetables, fruits, grains, meat, poultry, dairy products, and wool are produced today in quantities that could hardly be imagined before chemicals were available to stop insect infestations, improve growth, prevent disease, and provide treatment after disease occurs. The invention of

farm machinery and power equipment, sparked by Cyrus McCormick's invention of the reaper in the 19th century, increased farm productivity to the level where one farmer could produce enough to feed 11 people. The development of pesticides and other agricultural chemicals helped boost farm productivity so that today nearly 75 people can be fed by the efforts of a single farmer.

Although pesticides are used in the United States mainly to produce food and fiber to adequately feed and clothe a growing population of nearly 300 million people, they are also valuable in other ways. Pesticides suppress insects and other pests that carry such human diseases as malaria, typhus, sleeping sickness, and bubonic plague. They protect our forests from insect damage, control brush, and make indoor and outdoor living relatively free of biting and nuisance insects.

THE EVOLUTION OF PESTICIDES

Farmers experimented with many materials for combating pests before commercial pesticides were developed. Whale oil, rosin, soap, and kerosene were found to discourage some pests; Paris green, lime sulfur, Bordeaux mixture, and London purple controlled others. In the early 1900s, industry began manufacturing chemicals for use on farms. Arsenic compounds were used widely at first. Hydrogen cyanide was found to be effective against scale insects, and sulfur dioxide proved useful for fumigating stored grain.

Over the years, materials and methods of applying them improved. In the 1940s, pesticides for saving human lives in war-torn, pest-ridden areas became available. DDT was among the earliest and proved to be as effective against crop-destroying pests as it was against human disease carriers. The first synthetic fungicides were also developed around this time.



Today, more than 600 different chemicals—in 60,000 formulations—are registered with the U.S. Department of Agriculture for sale as pesticides.

Chemical pesticides are only one of several methods used to combat agricultural pests. Other methods include planting varieties resistant to certain insects and diseases, practicing special cultural techniques such as crop rotation and deep plowing, and using biological agents such as insect-eating birds and predator insects.

Farmers, foresters, horticulturists, and home gardeners use these means, when practical, to reduce pest damage. Plant scientists contribute by breeding resistant varieties. But when these means are not sufficient to keep a pest problem under control, pesticides must be employed.



PESTICIDES USED IN AGRICULTURE

Insecticides control injurious insects affecting plants, animals, and humans.

Fungicides prevent plant diseases caused by fungi or prevent decays of harvested crops and rots of wood products.

Herbicides control unwanted plants.

Rodenticides control mice, voles, rats, and other rodents.

Nematicides control plant-destroying nematodes.

Miticides control spider-like mites that feed on plants and animals.

Plant growth regulators make plants grow faster, slower, or in some other way more beneficial to the grower.

Defoliant and desiccants speed up the drying of plant tissue or cause leaves and foliage to drop from plants.

Pheromones disrupt normal insect reproductive patterns.

INTEGRATED PEST MANAGEMENT

Integrated pest management, or IPM, has been around for thousands of years. But in the early 1970s, IPM became the “in” thing and has continued to be popular ever since. IPM is merely the practice of using every means available to keep pests at or below levels at which we can live with them. It uses such things as host-plant resistance, cultural practices, biological control agents, and pesticides. The four principles of IPM are natural control, knowledge of the biology of the pests, economic thresholds, and scouting. More detailed explanation of these can be found in the 4-H IPM booklet.

Pesticides in Your 4-H Project, Unit 2-IPM is designed for use either by itself or as part of the 4-H IPM project.

Although IPM attempts to use all available means to keep pest levels down, ultimately we must rely upon chemicals. In this project you must use the principles of IPM in order to determine when it becomes necessary to spray.

To do this, first identify the problem(s). When this has been done, determine the pest population, and develop a plan of attack. Determine at what pest population level it will become necessary for you to use chemicals. When it becomes necessary, use the proper chemicals, in a safe manner, according to all label instructions. Adult supervision may be necessary or at least preferred.

Knowledge of pest populations is very important. A pest count should be made just before chemical application. Follow-up counts should then be made at 24-hour intervals for one week to determine the success of the application and the degree of residual activity. (NOTE: Under NO circumstances should you enter the sprayed area or make any counts before the reentry period specified on the chemical label).

Record all data for your records for this project. Repeat applications through the season as determined by the IPM principles.



GUIDEPOSTS TO SAFE PESTICIDE USE

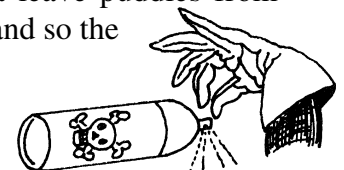
USE YOUR HEAD:

- Never use a pesticide without the guidance of your parents.
- Use a pesticide only when it is needed. Be sure you use the one recommended for the pest you want to control.
- Read the label before you buy. Make sure the label lists the name of the pest you want to control.
- Always read the entire label on every container each time you use it.
- Follow the instructions exactly. Pay special attention to precautions and also to information about what to do in case of accident.



HANDLE PESTICIDES CAREFULLY

- Do not try to mix pesticides yourself. This should only be done with the help of parents.
- Mix or dilute sprays out-of-doors or where there is adequate ventilation.
- Apply pesticides only as specified and only to the plants listed on the label. Cover bird-baths, dog and cat dishes, and fish pools before spraying.
- Use only the prescribed amount. Twice as much is not twice as good; it may harm instead of help.
- Pour leftover spray solutions into the ground so they will not leave puddles from which pets might drink and so the pesticide won't get into the water supply.





ABC'S OF PESTICIDE STORAGE

Always keep pesticides in their own labeled containers, so you know what they are and how to use them.

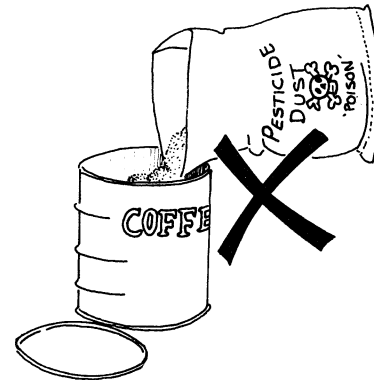
PROTECT YOUR HEALTH

- If the label says to avoid skin contact, it will help to wear long-sleeved clothing and gloves when you mix and apply pesticides.
- Avoid inhaling chemical fumes, mists, or dusts. Never use spray or dust in the garden on a windy day. Stand where spray or dust will drift away from you, not on you or your pets.
- If you accidentally spill spray or dust on yourself or someone else, **STOP** immediately. Remove the soiled clothes and wash the exposed skin thoroughly.
- Wash hands and face after using pesticides, especially before handling food.



HAVE A HEART

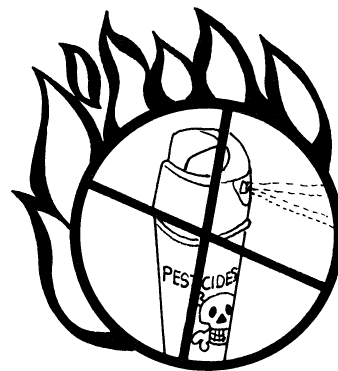
- Watch when spraying or dusting so that the pesticide does not blow back on the person using it.
- Spray or dust should not be used in the garden on a windy day.
- Stand where spray or dust will drift away from you, not on you or your pets.
- Cover birdbaths, dog and cat dishes, and fish pools before spraying.



Be careful to keep pesticides separate from food supplies and out of the reach of small children and pets. A locked cupboard in the garage or tool shed is a safe place to keep them.



Careful storage of flammable pesticides, away from flames and hot places, is good fire insurance. The label will tell you if a pesticide is flammable; these must be handled as cautiously as gasoline and other quick-burning fluids.

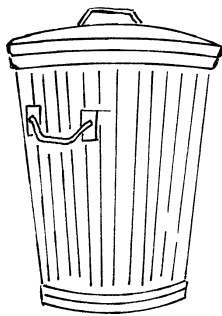


HOW TO DISPOSE OF EMPTY CONTAINERS AND UNWANTED PESTICIDES

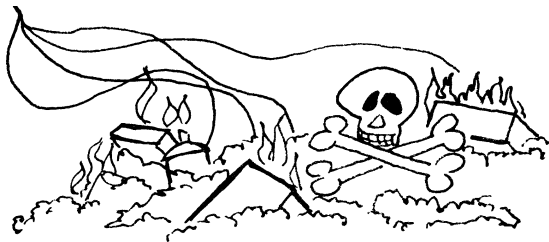
Pesticide containers must not be used again for any purpose. Empty metal and glass containers should be placed in a closed trash can. Where possible, the container should be destroyed before disposal to prevent reuse.

Do not puncture or burn aerosol cans. They can explode! Put the whole aerosol can into the trash can.

You may put small amounts of pesticides, if left in their original containers, in the trash can; replace the lid tightly.



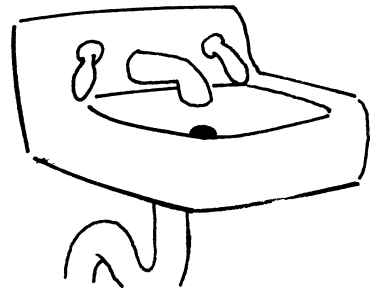
Empty paper and cardboard containers should be put in the trash can or burned. Stay out of the smoke, and be sure that the smoke will not drift over to your neighbor.



Dispose of unwanted pesticides by digging a hole 18 inches deep in an isolated place in the backyard. Empty the pesticide into the pit and cover it with at least 1 foot of soil.



Do not flush pesticides down the drain. They can damage sewage systems, contaminate water, and harm fish and other forms of water life.



APPLICATION EQUIPMENT

Hand-operated sprayers and dusters are effective for applying pesticides to control insects, weeds, and plant diseases in the home, yard, and garden.

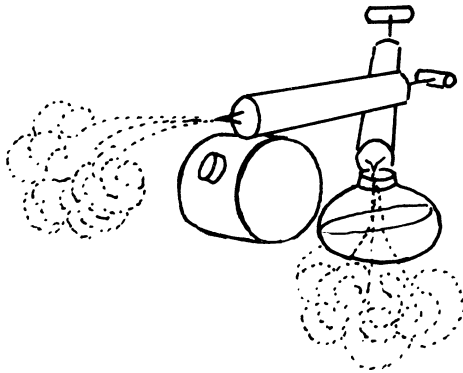
A type and size of sprayer or duster is available for every application of pesticide. Some units serve multiple purposes; others are designed for specific purposes. The choice of a sprayer or duster depends on the size of the job, the type of application desired, and the type of pesticide used.



Pesticides are commonly available as solutions, emulsions, or wettable powder suspensions which are added to water to make spray solutions. Pesticides are also available as dust mixtures which are applied in dry form.

HOUSEHOLD SPRAYERS

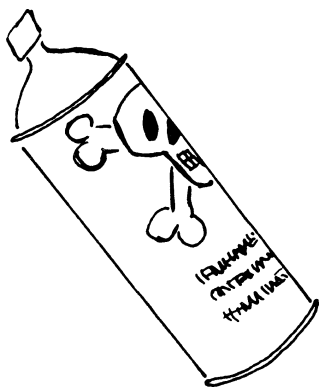
Two popular types of household sprayers are the intermittent and the continuous pressure. Both are used to spray sediment-free material for controlling flies, mosquitoes, roaches, moths, and other household pests. They are economical to buy and to operate. The nozzle of an intermittent sprayer delivers a fine-droplet spray with each forward stroke of the pump. The continuous-pressure type delivers a spray of uniform pattern while the pump is being operated. Most continuous sprayers have either interchangeable or adjustable nozzles.



The capacity of household sprayers ranges from a few ounces to 3 quarts. Do not use these sprayers to apply spray materials that contain suspended solids because the nozzle opening (which is usually small) will clog. Wettable powders do not work well in household sprayers.

AEROSOL BOMBS

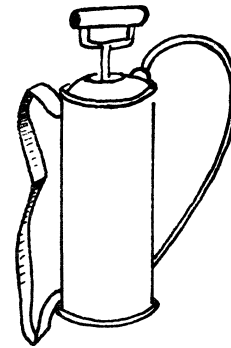
The aerosol bomb is generally used to control flies, mosquitoes, and other insects in the home. This sprayer is manufactured by mixing a propellant material with the insecticide which is placed in the can under pressure. Aerosol bombs should be stored in a cool place and never thrown into a fire after use.



COMPRESSED-AIR SPRAYERS

Compressed-air sprayers are commonly used for applying pesticides around the home and farm on flowers, shrubs, fruits, and vegetables. Small sprayers are equipped with a carrying handle, while large ones come with a shoulder strap.

The tanks hold 1½ to 5 gallons. For best results, fill the tank not more than three-fourths



full of spray material. This leaves an air space at the top for building up air pressure with the pump. If wettable powder is used, mix the material well. While spraying, shake the tank occasionally to keep the material mixed and to prevent settling. Use caution in opening the sprayer if air pressure remains in the tank.

Compressed-air sprayers can be equipped with various types of nozzles to provide hollow cone, solid cone, flat fan, or solid stream spray patterns. Some models have an adjustable nozzle to provide a range of droplet sizes.

BUCKET AND SLIDE PUMPS

These sprayers are suitable where high pressure and portability are necessary but where more expensive equipment is not justified. The spray container for each type must be furnished by the user.

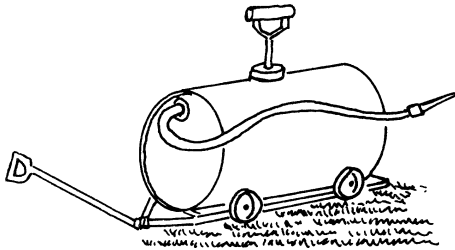
Bucket and slide pumps develop pressures of 150 to 175 lb. They are adapted for spraying shrubbery, vegetables, flowers, and small fruit trees. They may be used as emergency firefighting equipment.

The bucket pump is a simple plunger type equipped with an air chamber for continuous



pressure and discharge. A footrest bracket attached to the pump supports and holds it in position for spraying.

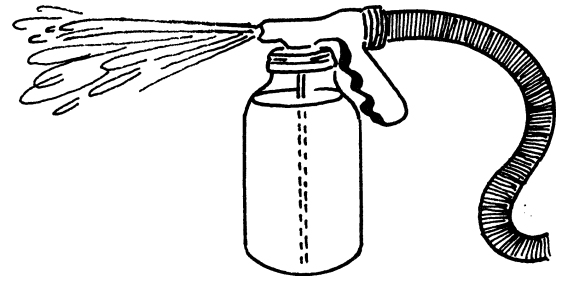
The slide pump contains a telescoping plunger-type unit that is an integral part of the discharge system.



WHEELBARROW SPRAYERS

Wheelbarrow sprayers—largest of the mobile, hand-operated pressure units—have the capacity for spraying trees, gardens, truck crops, greenhouses, and buildings. The sprayer consists of a tank with a capacity of 12 to 18 gallons, a wheel-mounted frame, a hand pump, an agitator, and a pressure gauge.

GARDEN-HOSE SPRAYERS



This sprayer is designed to connect to a garden hose and use the household water pressure for applying pesticides. The unit consists of a jar to hold concentrated spray material with a spray gun attached to the lid. The gun meters out the spray concentrate from the jar by suction through jets and mixes it with the water flowing from the garden hose. A 1-quart jar of concentrated solution will make 5 to 6 gallons of dilute spray as it leaves the hose sprayer nozzle.

This type of sprayer, although useful, is limited to the area that can be reached with the garden hose. It does not work well with wettable powders or other sediment-forming pesticides.

PACKAGE-TYPE DUSTERS

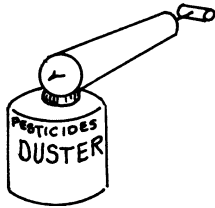


Some pesticide dusts are sold in containers that serve as hand applicators and are discarded when empty. These include shake types, flick types, plastic squeeze types, and plunger carton types. They are intended for limited use and may be very convenient for small jobs.

PLUNGER DUSTERS

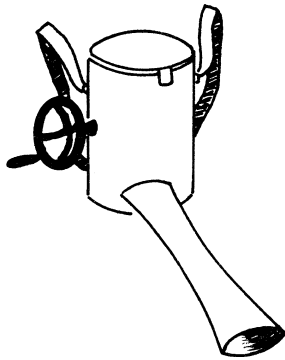
Plunger dusters are commonly used for applying dust materials to relatively small areas or for spot treatment. They vary in size and capacity, and are especially useful for such jobs as dusting vegetables and ornamental plants in the home garden and for controlling chiggers and ants in the lawn.

The plunger duster consists of a hand-operated air pump similar to that of the household sprayer, a dust container, and the discharge assembly. Nozzles on most types can be adjusted to discharge the dust at various angles.



CRANK DUSTERS

The crank duster consists of a blower (driven by a hand crank), a dust hopper with agitator for feeding dust to the blower, dust delivery tubes, and nozzles. The duster is carried in front of the operator with shoulder-strap harness.

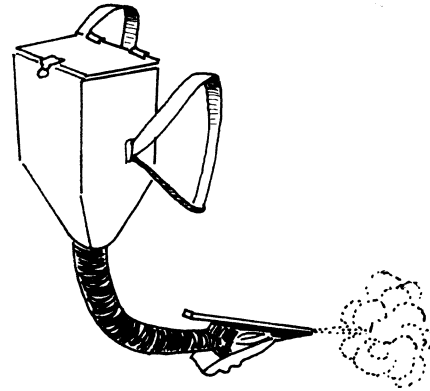


KNAPSACK DUSTERS

The knapsack duster is carried on the back with shoulder straps. A bellows generates the air blast, which draws the pesticide from the dust chamber and discharges it through the nozzle outlet with each stroke of the handle. This pro-

duces an intermittent action particularly suitable for spot treating individually spaced plants.

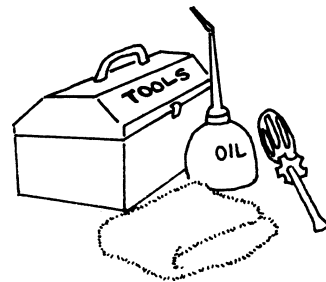
Knapsack sprayers have built-in spray pumps which the operator works continuously to maintain the necessary pressure. Spray material in the tank is agitated by mechanical means in some models and by hydraulic or jet action in others. Tank sizes range from 4 to 6 gallons.



CARE AND MAINTENANCE OF EQUIPMENT

Manufacturers of sprayers and dusters usually provide information on the care and maintenance of each type of equipment. These recommendations should be followed for lubrication, operation, and maintenance.

Drain sprayer tanks after each use and flush with clean water, taking care not to contaminate streams, ponds, and other water supplies. Where possible, disassemble and clean thoroughly all parts of the sprayer, especially nozzles and screens. Before reassembling the nozzle, fill the tank partly full with water and force it through the open nozzle to clean out the discharge line. Apply oil to all sprayer parts that might rust.



Dusters, except package dusters, should be emptied and cleaned after using to prevent caking, clogging, and eventual corrosion. Store equipment in a dry place.

CONVERSION TABLE FOR SMALL QUANTITIES

LIQUID PESTICIDES

Fluid Measure

- 3 teaspoons = 1 tablespoon
- 2 tablespoons = 1 fluid ounce
- 8 fluid ounces = 1 cup
- 2 cups = 1 pint
- 2 pints = 1 quart
- 4 quarts = 1 gallon
- 32 fluid ounces = 1 quart

Conversion of 100-Gallon Spray Recommendations to 1-Gallon Usage

Amount of liquid pesticide
recommended for 100 gallons of spray

Amount of liquid pesticide
to use in 1 gallon of spray

10 gallons
1 gallon
1 quart
1 pint

12 1/2 fluid ounces or 4/5 pint
1 1/4 fluid ounces or 8 teaspoons
2 teaspoons
1 teaspoon

DRY PESTICIDES

Dry Measure

- 3 level teaspoons = 1 level tablespoon
- 16 level tablespoons = 1 cup
- 2 cups = 1 pint
- 2 pints = 1 quart

Conversion of 100-Gallon Spray Recommendations to 1-Gallon Usage

Amount of pesticide recommended
for 100 gallons of spray

Amount of pesticide to use
in 1 gallon of spray

5 lb
4 lb
3 lb
2 lb
1 lb

5 tablespoons
4 tablespoons
3 tablespoons
2 tablespoons
1 tablespoon

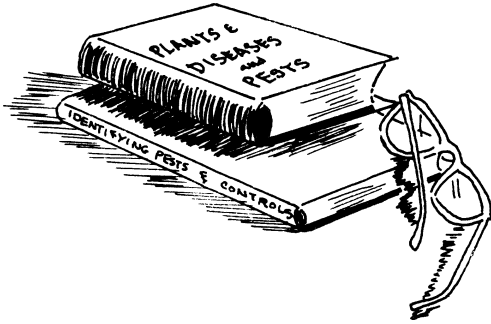
BE INFORMED

Know the reason for using a pesticide.

Identify the pest to be controlled. If it is an insect, identify the insect; if a plant disease, identify the disease; if a weed, identify the plant.

Learn the best method of solving the problem. Pesticides may or may not be needed.

If using a pesticide is the answer, learn which chemical to use, how much, when, where, and how to use it.



SOURCES OF INFORMATION

Information on pesticide use can be obtained from the following sources:

- The Clemson University Agricultural Extension Service publishes information on agricultural chemical usage—identification of pests, selection of chemicals, rates of application, and how to use pesticides.
- Your club leader or county Extension agent has information sources available. If either of them does not have an answer to your pest problem, he or she can contact specialists, who will do their best to provide the answer.
- The U.S. Department of Agriculture produces publications dealing with problems requiring pesticide use.
- Most pesticide manufacturers can provide supplementary information on use of their products. All chemical packages have a label that contains much valuable information on proper usage and precautions. Read it and heed it.

PESTICIDE SAFETY CHECK SHEET

No

Yes

- _____ _____ Do you always read the label before using sprays and dusts?
- _____ _____ Do you follow all directions?
- _____ _____ Do you store pesticides in their original containers with labels intact?
- _____ _____ Do you keep pesticides out of the reach of younger children, pets?
- _____ _____ Do you avoid inhaling sprays or dusts when mixing or applying pesticides?
- _____ _____ Do you avoid spilling pesticides on your skin or clothing?
- _____ _____ If pesticides are spilled on you accidentally, do you wash immediately?
- _____ _____ Do you wash your hands thoroughly after handling pesticides and before eating?
- _____ _____ Do you cover food and water containers when you use pesticides near food or around your pet's food dishes?
- _____ _____ Do you always dispose of empty containers so they are no danger to people, pets, or food and water?



Think Twice... You Only Live Once

(Fill in the words you think are right to complete the statement.)

In case of accidental poisoning, call a _____ or get _____ to take the victim to the _____ immediately. Hospitals and doctors have the information and know how to treat _____ effectively if they are called _____ enough.

Answers to tests:

A PESTICIDE SAFETY TEST: All answers should be yes.

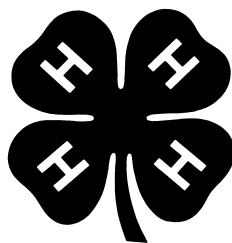
Think Twice...You Only Live Once:

In case of accidental poisoning call: doctor, help, hospital,
poisoning, soon

4-H Club Pledge

I pledge:

My Head to clearer thinking,
My Heart to greater loyalty,
My Hands to larger service, and
My Health to better living for
My Club, My Community, My Country,
and My World.



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