

**Missouri Private
Applicator**

**Recertification
Manual
86**

Archive Version - See
extension.missouri.edu

About this manual

This manual was prepared for use in Missouri's Pesticide Applicator Training Program and is intended to provide the information needed to meet the minimum Environmental Protection Agency (EPA) standards for recertification of private applicators under the Federal Insecticide, Fungicide, and Rodenticide Act and the Missouri Pesticide Use Act.

This manual is a complete revision of EC934, *Private Pesticide Applicator Recertification*. It was prepared as a training manual for private applicators who wish to become recertified. Familiarity with the information in this manual should be considered a prerequisite to pesticide use by any applicator.

After reading each chapter, answer the review questions using MX 851, *the Review Question Answer Sheet*. Compare your answers with the correct answers listed on the last page of the manual. You will not be graded on your responses. When you are comfortable with the information in the manual, complete your recertification verification form at your local University Outreach and Extension Center.

This manual does not provide all of the information you need for safe and effective use of pesticides. Examine the label for each pesticide you use. Labels must list directions, precautions, and health information — all of which are updated regularly when a pesticide is registered for use in Missouri. If information on a current pesticide label conflicts with information in this manual, follow the label.

Manufacturers will supply additional information about products registered for use in Missouri. Information is also available from the (1) Office of the Pesticide Coordinator, 212 Waters Hall, University of Missouri-Columbia, Columbia, MO 65211, or phone (573)884-6361 or at <http://etc.s.ext.missouri.edu/agebb/pest/pat/index.htm>; (2) Pesticide Impact Assessment Program, 45 Agriculture Building, University of Missouri-Columbia, Columbia, MO 65211 or phone (573) 882-7871; or (3) Missouri Department of Agriculture, P.O. Box 630, Jefferson City, MO 65102 or phone (573) 751-2462 or at www.state.mo.us/mda.

Missouri's Pesticide Applicator Training Program is a cooperative effort. The Missouri Department of Agriculture is the state lead agency. MU Extension at the University of Missouri-Columbia is responsible for the content of the training program. The EPA and the Missouri departments of Conservation, Health, Natural Resources, and Transportation also contribute to the development of educational materials and participate in the training program.

Extension Publications

To order additional copies of this manual or other documents published by MU Extension, call

1-800-292-0969

Extension Publications
2800 Maguire Blvd.
University of Missouri
Columbia, MO 65211

<http://muextension.missouri.edu/xplor/>

Contents

Principles of Pest Control	1
Pesticides in the Environment	4
The Pesticide Label	6
Protect Yourself from Pesticides.....	8
Harmful Effects, Emergency Responses and Spills	10
Pesticide Storage and Disposal	13
Sprayer and Granular Applicator Calibration.....	15
Pesticide Laws and Regulations	17
Answers to Review Questions.....	20

Principles of Pest Control

An agricultural pest is one that competes with man for food or fiber. The designation of a particular organism as a pest and its identification must be established before any pest control program is implemented.

The primary goal of a pest control program is to reduce pest damage to an acceptable level. In most cases, the objective is not total eradication because it is unrealistic and impractical.

The decision-making process must be followed to intelligently and effectively plan and carry out a pest control program. The principal elements of that process are outlined below; although they deal specifically with crop pests, the general principles would also apply to livestock, ornamentals and forestry.

Detection. The importance of detecting pest infestations before they become a problem cannot be overemphasized. Failure to do so results in increased control costs, less effective or ineffective control measures and significant crop damage.

Detection requires frequent and careful field monitoring, a knowledge of common pests of the particular crop in question, an ability to recognize potential problems and a thorough knowledge of crop growth characteristics. The ability to recognize abnormal plants and pest damage is a must.

Identification. An organism is not classified and treated as a pest until it is proven to be one. A species may be a pest in some situations and not in others. The more known about a pest and the factors influencing its behavior the easier and more successful pest management becomes. Identifying a pest gives access to its biological information, and knowing a pest's life cycle is essential. For example, with insect control, the application of an insecticide needs to coincide with the susceptible life stage. In many cases, only one stage such as the larval stage, is susceptible. Typically, pesticides affecting the eggs or pupae are not available.

Economic significance. Control of a particular pest should be considered only when it is believed that economic damage will occur. Pesticide applications should be avoided when their cost is greater than the pest damage. Factors that influence the application decision include the current value of the commodity being produced, the crop stage and pest development, the degree of damage, the cost and effectiveness of control measures and the anticipated yield.

Selection of methods. Once a pest problem is identified, the appropriate method or combination of methods are selected to achieve effective, practical, economical and environmentally sound control. Proper selection requires the applicator to be thoroughly familiar with all available control methods.

Evaluation. It is important to evaluate the results of a control program. This is done in several

ways: pest counts or infections before and after treatment, comparative damage ratings, yield data, etc. In most cases it is difficult, if not impossible, to do an adequate evaluation without leaving untreated checks to use as a basis for comparison. The results obtained should be recorded for future reference.

Pest identification services

For weed, insect and disease problems, take fresh specimen samples to your local University Outreach and Extension Center. If a local specialist can not properly identify the specimen, ask that it be sent to the University of Missouri.

- **Weed/Plant identification.** The University of Missouri can identify weeds/plants for \$10 per sample.

- **Insect identification.** The University of Missouri can identify insects, mites, ticks, spiders and related pests and provide control measures. No charge.

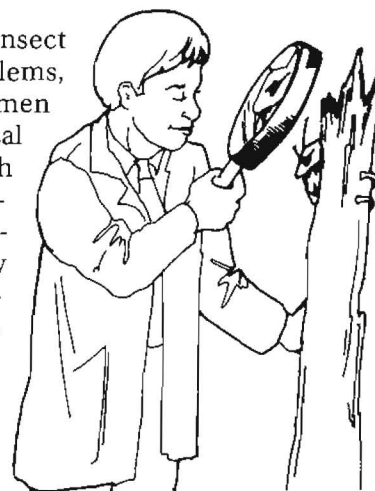
- **Disease identification.** The University of Missouri can help diagnose plant diseases including leaf spots, wilts, decays, blights, etc. and give advice on control for no charge. Although there are some special tests for plant viruses that have a fee. (see form on next page)

Send weed/plant, insect and disease samples to:

Extension Combined Diagnostic Clinic
42 Agriculture Building
University of Missouri
Columbia, MO 65211

- **Nematodes.** The University of Missouri provides various testing procedures for the detection of plant parasitic nematodes. Call (573) 882-2716 for information regarding available tests and their costs. Fill out MP655, *Plant Nematode Sample Submission Form*, at your local University Outreach and Extension Center and send it along with your sample(s) to:

Extension Plant Nematology Laboratory
108 Waters Hall
University of Missouri
Columbia, MO 65211



Plant Disease Identification Form

FOR LAB USE ONLY

SAMPLE LOG # _____

O _____

D _____

Extension Plant Diagnostic Clinic

(573) 882-3019

E-Mail: corwinb@missouri.edu or plantsci@missouri.edu

For suggestions on taking and shipping samples see the reverse side of this form. Send completed form to:
Plant Disease Identification, 42 Agriculture Building, University of Missouri-Columbia, Columbia, MO 65211

Submitted by:

Obtained from: Commercial Homeowner

Name _____

Name _____

Address _____

Address _____

Day Phone (____) _____

Day Phone (____) _____

Name of plant (crop) and variety _____

Date collected _____ Date Sent _____ County of sample origin _____

Has problem occurred previously? _____ If so, when _____

When were symptoms first noted this year? _____

Location	Disease incidence	Symptoms	Parts affected	Distribution	Soil type
<input type="checkbox"/> Field	No. of acres _____	<input type="checkbox"/> Abnormal growth	<input type="checkbox"/> Branches	<input type="checkbox"/> Certain variety	<input type="checkbox"/> Clay
<input type="checkbox"/> Golf course	Percent acres _____	<input type="checkbox"/> Dead areas	Percent affected _____	<input type="checkbox"/> Edge of field	<input type="checkbox"/> Loam
<input type="checkbox"/> Greenhouse	— or —	<input type="checkbox"/> Dieback	<input type="checkbox"/> Entire plant	<input type="checkbox"/> General	<input type="checkbox"/> Potting soil
<input type="checkbox"/> Houseplant	No. of plants _____	<input type="checkbox"/> Leaf drop	<input type="checkbox"/> Flowers	<input type="checkbox"/> High areas	<input type="checkbox"/> Sandy
<input type="checkbox"/> Lawn	Percent plants _____	<input type="checkbox"/> Leaf spot	<input type="checkbox"/> Fruits/seeds	<input type="checkbox"/> Low areas	<input type="checkbox"/> Soilless mix
<input type="checkbox"/> Nursery	— or —	<input type="checkbox"/> Rot	<input type="checkbox"/> Leaves	<input type="checkbox"/> Scattered	Soil pH _____
<input type="checkbox"/> Orchard	No. of sq. ft. _____	<input type="checkbox"/> Stunted	<input type="checkbox"/> Roots	<input type="checkbox"/> Shaded areas	
<input type="checkbox"/> Pasture	Percent _____	<input type="checkbox"/> Wilted	<input type="checkbox"/> _____	<input type="checkbox"/> Spots	Drainage <input type="checkbox"/> Good <input type="checkbox"/> Poor
<input type="checkbox"/> Plant bed	No. of sq. ft. _____	<input type="checkbox"/> Yellowed		<input type="checkbox"/> Sunny areas	
<input type="checkbox"/> Yard/garden	Percent affected _____	<input type="checkbox"/> _____		<input type="checkbox"/> Wet areas	
<input type="checkbox"/> _____				<input type="checkbox"/> _____	

Turfgrass: When established? _____ Sod Seeded Plugs

Trees/shrubs/ornamentals: Age? _____ Size? _____ When transplanted? _____

Additional information

Chemicals used: Herbicides (for field crops include materials used on previous crop), insecticides, fungicides and growth regulators.

Fertility program (for field crops please includes a copy of recent soil test results)

Cropping history

Other

Please use a separate sheet of paper to provide additional information that you believe will aid in diagnosis.

■ University of Missouri, Lincoln University, U.S. Department of Agriculture & Local University Extension Councils Cooperating ■ An equal opportunity/ADA institution

Integrated pest management

Integrated pest management is the combining of appropriate pest control tactics into a single plan to keep pest densities and crop damage below the economic threshold. With some types of pests, using only pesticides will achieve poor control. The strategy chosen will depend on the pest and the kind and amount of control needed.

Natural controls. Some forces act on all organisms, causing the populations to rise and fall. Natural forces that affect pest populations include climate, natural enemies, natural barriers, availability of shelter, and food and water supplies.

Applied controls. Unfortunately, natural controls often do not control pests quickly or completely enough to prevent unacceptable injury or damage. Then other control measures must be used. Those available include:

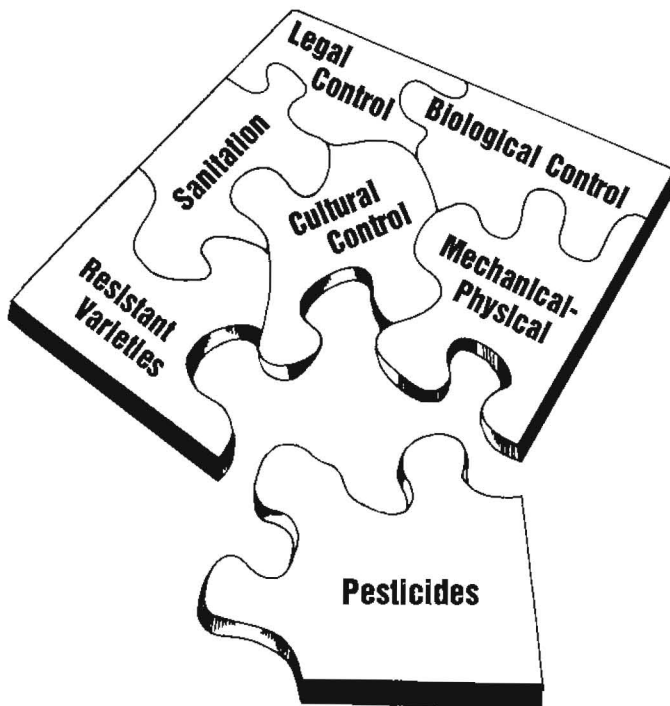
- host resistance
- biological control
- cultural control
- mechanical control
- sanitation
- chemical control

Pest control failures

Sometimes a pest is not controlled after a pesticide is applied. There are several possible reasons for the failure of chemical pest control.

Pest resistance. Pesticides fail because the pests are resistant. When one pesticide is used repeatedly against the same pest, the surviving pest population becomes more resistant to the pesticide than the original population. The opportunity for resistance is greater when it is used over a wide geographic area or when a pesticide is applied repeatedly to a localized area where pest populations are isolated. Rotating families of pesticides may help reduce the development of pest resistance. For more detailed information on resistance, ask for MU Guidesheet G4907, *Herbicide Resistance in Weeds*.

Other reasons for failure. Make sure the correct pesticide, dosage and application were applied. Sometimes a pesticide application fails because the pest was not identified correctly and the wrong pesticide was chosen. Other applications fail because the pesticide was not applied at an appropriate time. Thus the pest was not in the area during the application or it was in a life cycle stage where it was not susceptible. Additionally pests could be part of a new infestation that developed after the chemical was applied.



Review questions

1. The primary goal of a pest management program is to eradicate a pest. (True or False)
2. One of the first steps in a pest management program should be to identify the pest(s). (True or False)
3. Pest control that involves the use of numerous tactics is called _____.
4. List four strategies for pest control other than using pesticides.
 1. _____
 2. _____
 3. _____
 4. _____
5. List three reasons why a pesticide may not have controlled a pest.
 1. _____
 2. _____
 3. _____

Pesticides in the Environment

The environment is everything around us. It includes not only the natural elements, but also people and the man-made components of the world. However the environment is not limited to the outdoors, it also includes the indoor areas where we live and work.

Sources of contamination

When environmental contamination occurs, it is the result of either point-source or nonpoint-source pollution. Point-source pollution comes from a specific, identifiable place (point). A pesticide spill that moves into a storm sewer is an example of point-source pollution. Nonpoint-source pollution comes from a wide area. The movement of pesticides into streams or rivers after a field application is an example.

Sensitive areas

Sensitive areas are sites or living things that are easily injured by a pesticide. Sensitive outdoor areas include:

- where ground water is near the surface or easily accessed (wells, sinkholes, porous soil, etc.)
- in or near surface water
- near the habitats of endangered species (check with your local University Outreach and Extension Center for information pertaining to endangered species habitats in Missouri's counties)
- near apiaries (honeybee sites), wildlife refuges or parks
- near ornamental gardens, food or feed crops or other sensitive plantings

Sensitive indoor areas include:

- where people live, work or cared for
- where food or feed is processed, prepared, stored or served
- where domestic or confined animals live, eat or cared for
- where ornamental or other sensitive plantings are grown or maintained

Pesticide movement

Pesticides that spread from the release site may cause environmental contamination. Remember, pesticides spread from indoor and outdoor release sites and cause harm in both environments. Pesticides spread in several ways:



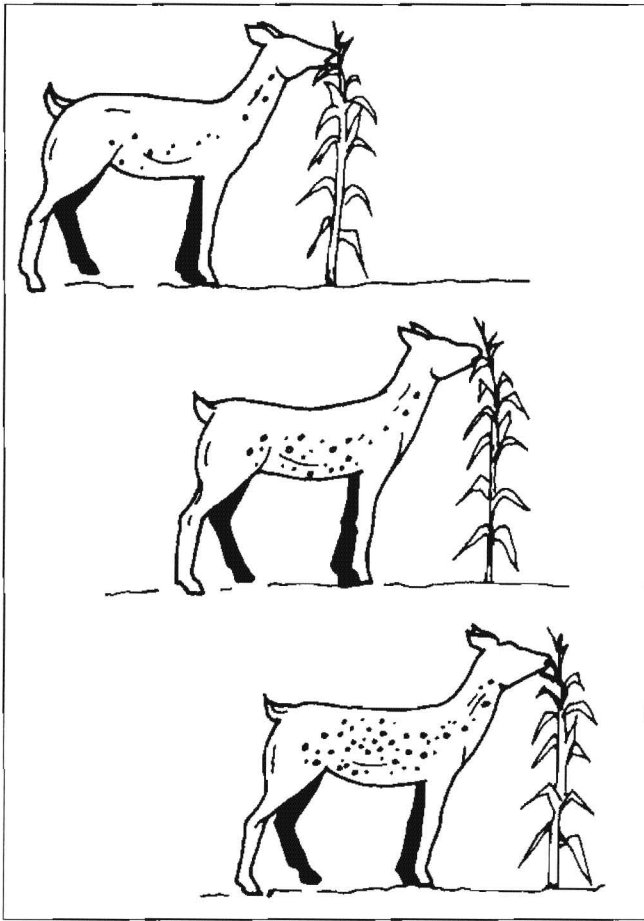
- in air, wind or through air currents generated by ventilation systems. Pesticide movement away from the release site in the air is usually called drift.
- in water, through runoff or leaching
- on or in objects, plants, or animals (including humans) that move or are moved offsite.

Harmful effects on nontarget plants and animals

Nontarget organisms may be harmed by pesticides that cause injury through direct contact or from a residue that causes later injuries.

Poorly timed applications can kill bees and other pollinators that are active in or near the target site. Drift from the target site may injure wildlife, livestock, pets, sensitive plants and people. It can also kill beneficial insect parasites and predators. Pesticide runoff may harm fish and other aquatic animals and plants in ponds, streams and lakes. Aquatic life is also harmed by careless tank filling or draining and by rinsing or discarding used containers along or in waterways.

A residue is the part of the pesticide that remains in the environment for a period of time following the application or a spill. Pesticides usually break down into harmless components after they are released. The breakdown ranges from less than a day to several years. The pesticide breakdown rate depends mostly on the chemical structure of the



active ingredient. It can also be affected by environmental conditions at the release site, such as:

- surface type (soil vs plant), chemical composition and pH
- surface moisture
- presence of microorganisms
- temperature
- exposure to direct sunlight

For more detailed information on the subject matter covered in this unit, ask for MU Guidesheet G7520, *Pesticides and the Environment*.

Review questions

1. The _____ is everything that is around us — indoors and outdoors.
2. Name the two types of environmental contamination.
 1. _____
 2. _____
3. Name three ways by which pesticides may move from their release site.
 1. _____
 2. _____
 3. _____
4. Sensitive plants are most commonly injured by drift of which pesticides:
 - a. Fungicides
 - b. Herbicides
 - c. Insecticides
 - d. Rodenticides
5. A _____ is the part of a pesticide that remains in the environment for a period of time following application or a spill.

The Pesticide Label

Pesticide users should realize the information and instructions on the pesticide label are based on years of extensive tests and studies. The label contains information for safe and effective use of the product. When the label is followed properly, the applicator is protecting himself as well as other applicators, consumers, fish and wildlife. Follow the label directions for each pesticide used; remember, the label is the law.

Sections of the label

Active ingredients. Active ingredients must be listed by the official common name approved by the EPA. If the pesticide does not have an EPA-approved common name, then the chemical name is listed. The manufacturer's trade name for the pesticide is shown on top in large letters.

Statement of practical treatment. First aid directions explain what to do in the event of a poisoning, such as "call 911" or "seek medical advice immediately." Some labels describe what actions to take until medical personnel arrive, such as "move the victim to fresh air" or "flush skin for 15 minutes with water." Initial first aid efforts on the scene are crucial; they help minimize the toxin's effects and can save a life. Physician instructions may also be included on the label.

Directions for use. Directions specify how a pesticide is to be applied, application rates, pests controlled and the restricted entry interval (REI). The REI is the waiting period necessary before humans or animals may enter a treated area.

Storage and disposal. Storage and disposal precautions are necessary to prevent accidental contamination, fire and/or poisonings. The storage statements include the optimal temperature and conditions for the pesticide storage. Disposal precautions are general safety statements about the proper disposal of the unused pesticide, residue and the container.

Hazard statements. Hazard statements are placed on pesticide labels to warn workers and handlers about the toxicity and potential hazard from inhalation, ingestion and/or dermal absorption. The levels of toxicity are represented by signal words in the table below. One hazard statement must be included on every pesticide label: "Keep Out of Reach of Children." Other hazard statements may include information on environmental impact and protective clothing requirements.

Pesticide toxicity

GROUP	SIGNAL WORD	TOXICITY RATING	LETHAL DOSE ^a
I	Danger ^b	Highly toxic	Few drops to 1 tsp
II	Warning	Moderately toxic	1 tsp to 1 Tbsp
III	Caution	Slightly toxic	1 Tbsp to 1 pint
IV	Caution	Relatively non-toxic	More than 1 pint

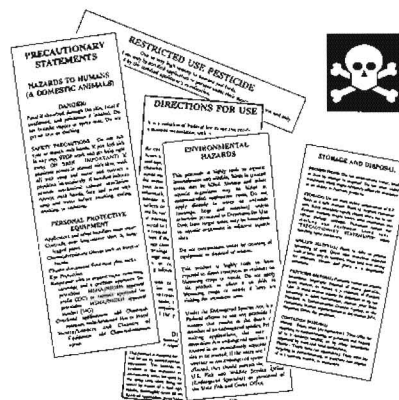
^a For a 160 pound human. A 40-pound child could be poisoned by one-fourth the amount.

^b "Danger," "Poison" and the skull and crossbones symbol if the potential for toxicity is greater.

Review questions

(Refer to the sample label on the next page to answer questions)

- List the signal word on the sample label that indicates the level of No-Weeds toxicity:
- How much No-Weeds would it take to kill a 160 pound human?
- List the active ingredient of No-Weeds:
- What should be done if eyes are exposed to No-Weeds?
- No-Weeds should not be stored in areas where temperatures are greater than _____.



Sample label

RESTRICTED USE PESTICIDE

For retail sale to and use only by certified applicators or persons under their direct supervision, and only for those uses covered by the certified applicators certification.

ACE

NO-WEEDS

HERBICIDE

ACTIVE INGREDIENT: BY WEIGHT
imaguwanafop
(1,4 dichloro phosphorate)75%
INERT INGREDIENTS25%
TOTAL 100%

EPA Reg. No. 123-456 EPA Est. No. 999

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

Wear long-sleeved clothing, full length trousers, eye protection, and protective gloves when handling. Wash hands and face before eating or using tobacco. Bathe at the end of the work day, washing entire body and hair with soap and water. Change clothing daily. Wash contaminated clothing thoroughly before reusing.

STATEMENT OF PRACTICAL TREATMENT

If swallowed: Do not induce vomiting. Contains aromatic petroleum solvent. Call a physician or poison control center immediately. **If in eyes:** Flush with plenty of water for at least 15 minutes. Get medical attention. **If on skin:** Wash with plenty of soap and water. Get medical attention if irritation persists. **If inhaled:** Remove to fresh air immediately. Get medical attention.

NOTE TO PHYSICIANS: If swallowed, there is no specific antidote. Lavage stomach. Treat symptomatically! The use of an aqueous slurry of activated charcoal and a saline cathartic should be considered.

ENVIRONMENTAL HAZARDS

This pesticide is toxic to birds and extremely toxic to fish. Do not apply directly to water. Do not contaminate water by cleaning of equipment or disposal of waste. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Avoid use when bees are actively foraging.

"No-Weeds" is a pesticide which can move (seep or travel) through soil and can contaminate groundwater which may be used as drinking water. Users are advised not to apply "No-Weeds" where the water table (groundwater) is close to the surface and where the soils are very permeable (i.e., well drained soils

such as loamy sands). Your local agricultural agencies can provide further information on the type of soil in your area and the location of groundwater.

STORAGE AND DISPOSAL

PROHIBITIONS: Do not contaminate water, food or feed by storage or disposal. Open dumping is prohibited. Do not reuse empty container.

STORAGE: Store in original container only. Keep container closed when not in use. Store "No-Weeds" in a well ventilated clean dry area out of reach of children and animals. Do not store in areas where temperature averages 115°F or greater. Do not store in or around the home or home garden. Do not store near food or feed. In case of spill or leak on floor or paved surfaces, soak up with sand, earth or synthetic absorbent. Remove to chemical waste area.

PESTICIDE DISPOSAL: Pesticide wastes are toxic. Improper disposal of excess pesticide, spray mixture or rinsate is a violation of federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency or the Hazardous Waste Representative at the nearest EPA Regional Office for guidance.

CONTAINER DISPOSAL: Do not reuse empty container. Triple rinse (or equivalent), puncture and dispose of in a sanitary landfill, or by incineration, or by open burning, if allowed by state and local authorities. If burned, keep out of smoke.

KEEP OUT OF REACH OF CHILDREN

WARNING

ACE CHEMICAL COMPANY
Columbia, MO 65211

2.5 GALLONS

U.S. Standard Measure

Protect Yourself From Pesticides

The greatest risk to the pesticide applicator occurs during application, mixing and loading of pesticide concentrates. Although application of diluted material is usually less hazardous, the hazard is increased when there is significant drift or when appropriate safety and application procedures are not followed. The danger of exposure also exists when cleaning up pesticide spills, making equipment repairs and entering treated areas prematurely.

Wearing protective clothing and/or equipment offers protection against exposure. Remember:

$$\text{Risk} = \text{Toxicity} \times \text{Exposure}$$

To reduce risk, choose pesticides with lower toxicity and/or reduce exposure.

Pesticide residues are absorbed through the skin at different rates on different parts of the body. The following table shows relative absorption rates for various parts of the human anatomy.

Anatomy	Percent Absorption ^a
Forearm	8.6
Palm of hand	11.8
Ball of feet.....	13.5
Abdomen	18.4
Scalp	32.1
Forehead.....	36.3
Ear canal.....	46.5
Scrotum	100.0

^aParathion was used in this study.

Clothing

Protective clothing should include a clean, long-sleeved shirt and pants made of a tightly woven fabric or a water-repellent material. A cotton T-shirt and shorts do not provide adequate protection when applying pesticides. Wash contaminated clothing separately from other clothing. Launder this clothing at the end of each day of use. Discard heavily contaminated clothing because they can not be cleaned and safely used again.

Coveralls, aprons, and raincoats

Coveralls, whether disposable or reusable, vary in their comfort, durability and the degree of protec-

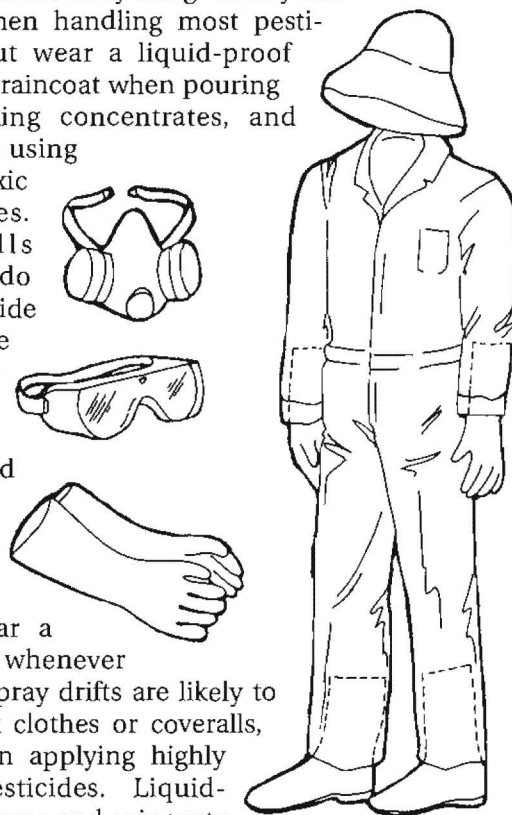
tion provided. They are generally adequate when handling most pesticides. But wear a liquid-proof apron or raincoat when pouring and mixing concentrates, and when using highly toxic pesticides. Coveralls usually do not provide adequate protection against spills and splashes of these chemicals. Wear a raincoat whenever mist or spray drifts are likely to wet work clothes or coveralls, and when applying highly toxic pesticides. Liquid-proof aprons and raincoats should be made of rubber or a synthetic material resistant to the solvents in pesticide formulations. The apron should cover the body from the chest to the boots.

Gloves

Always wear unlined, elbow-length neoprene or rubber gloves when handling any pesticide concentrate or chemicals that carry the signal words "Danger — Poison" or "Warning." When spraying overhead, wear shirt sleeves inside gloves. At all other times, wear shirt sleeves on the outside to prevent chemicals from entering gloves at the cuff. Pay special attention to labels when determining what type of gloves to wear, because some fumigants are absorbed readily by neoprene.

Never wear cotton or leather gloves. They absorb pesticides and provide constant exposure to the chemical; that can be more hazardous than not wearing gloves at all.

Always check gloves carefully for leaks before wearing them. Fill the gloves with water and squeeze. If leaks appear, discard the gloves. Before removing gloves, wash them with detergent and water to prevent hand contamination.



Boots

When handling or applying chemicals, wear unlined lightweight rubber boots that cover the ankles. Wear trouser legs on the outside so pesticides cannot drain down into the boots. They should be washed daily and dried thoroughly inside and out to remove pesticide residues.

Goggles or face shields

Wear tight fitting, nonfogging chemical splash goggles or a full-face shield when pouring, mixing or applying pesticides. Clean often and pay special attention to the sweatband. Some materials used in sweatbands hold chemicals. If possible, wear the sweatband under the head covering. Eye wear should meet or exceed the current requirements of ANSI.

Head and neck coverings

The hair and skin on your neck and head should be protected. Several types of head gear, such as waterproof rain hats, washable wide-brimmed hard or bump hats can be used. Waterproof parkas will protect the neck and head at the same time. Avoid headgear with a cloth or leather sweatband since these bands absorb chemicals and are difficult to clean; thus causing continuous and dangerous dermal exposure. Also avoid cotton or felt hats since they absorb pesticides.

Respirators

Respirators prevent inhalation of toxic chemicals. Wear a respirator when the label calls for one. They are necessary when handling concentrated, highly toxic pesticides. Workers exposed to small amounts of toxic pesticides for a day or more should always wear a respirator.

Specific cartridges and canisters protect against specific chemical gases and vapors. Be sure to choose the correct type. The respirator must fit the face snugly to ensure a good seal. Long sideburns, a beard or glasses may prevent a good seal.

Chemical cartridge respirator. The chemical cartridge respirator is usually a half-face mask, containing one or two "cartridges," that covers the nose and mouth only. The inhaled air that enters the cartridge is pulled through a filter pad and a cartridge of activated charcoal. Use chemical cartridge respirators either for relatively short exposure periods to high concentrations of toxic chemicals or for long exposure periods to low concentrations of toxic chemicals. This respirator should never be used in areas where the oxygen level is too low to support life (below 16 percent).

Chemical canister respirator (gas mask). Gas masks are designed to protect applicators longer than cartridge respirators. A gas mask usually protects the face better since it covers the entire face. Use a gas mask when exposed to high concentrations of

toxic fumes for long periods of time. Also, wear a gas mask when applying pesticides in enclosed or poorly ventilated areas. As with the chemical cartridge respirator, a gas mask should never be used in areas where the oxygen level is too low to support life.

Air-supplied respirator. An air-supplied respirator should be worn in areas where the oxygen supply is low or where the applicator is exposed to high concentrations of very toxic pesticides in enclosed areas. Fresh air is pumped into the face mask by a blower from an uncontaminated area or from a backpack.

Care and maintenance of respirators. If breathing becomes difficult during heavy work, change the filters in chemical cartridge respirators two or more times a day. Cartridges should be changed after eight hours of use or sooner if pesticide odor is detected. The face piece should be washed with soap and water, rinsed, dried with a clean cloth and stored in a clean, dry place away from pesticides. A tightly closed plastic bag works well for storage.

The useful life of a cartridge or canister depends on the type and amount of chemical fill used, the concentration of contaminants in the air, the breathing rate of the wearer and the temperature and humidity. The manufacturer's instructions on the use and care of a respirator and its parts should be read carefully before the respirator is used. Use only respirators approved by the National Institute for Occupational Safety and Health or the Bureau of Mines.

Review questions

1. To reduce the risk of pesticide use, the applicator should choose pesticides which have lower _____ and reduce _____.
2. Pesticide residues are absorbed through the skin at relatively the same rate on different parts of the body. (True or False)
3. A cotton T-shirt and shorts provide adequate protection when applying pesticides. (True or False)
4. How often should protective clothing be laundered?
 - a. Once a week
 - b. Once per season
 - c. When the clothing smells of pesticides
 - d. At the end of each day of use
5. Gloves and boots worn when handling most pesticides should be made of:
 - a. Canvas
 - b. Leather
 - c. Lined rubber
 - d. Unlined rubber

Harmful Effects, Emergency Response and Spills

There are two kinds of clues to watch for regarding pesticide-related illness or injury. Some clues are only noticed by the person who has been poisoned, such as nausea and headache. Other clues that someone else can notice include vomiting and fainting. Many of the signs and symptoms of pesticide poisoning are similar to signs and symptoms of other illnesses, such as flu or a hangover. If you have been working with pesticides and then develop suspicious signs and symptoms, call your physician or poison control center. Only a physician can diagnose pesticide poisoning injuries.

External irritants cause:

- redness, blisters, rash and/or burns on skin, and
- swelling, a stinging sensation and/or burns in eyes, nose, mouth and throat.

Pesticide poisoning may cause:

- nausea, vomiting, diarrhea and/or stomach cramps
- headache, dizziness, weakness, and/or confusion,
- excessive sweating, chills and/or thirst
- chest pains
- difficult breathing
- cramps in your muscles or aches all over your body

The information contained on a pesticide label can help save a person's life, because it helps emergency medical personnel know what antidote or procedures are necessary to counteract the pesticide and minimize the effects of the toxins on the body. **Remember:** It is essential that a poisoning victim receives immediate medical attention, so in the event of a suspected pesticide poisoning call 911 or other emergency medical personnel immediately. Keep the pesticide label with you as emergency medical personnel will need to consult that information.

First aid for pesticide poisoning

The best first aid in pesticide emergencies is to stop the source of pesticide exposure as quickly as possible. First aid is the initial effort to help a victim while medical help is on the way. If you are alone with the victim, make sure the victim is breathing and is not being further exposed to the pesticide before you call for emergency help. Apply artificial respiration if the victim is not breathing. Do not become exposed to the pesticide yourself while you are trying to help.

In emergencies, look at the pesticide labeling. If it gives specific first-aid instructions, follow those instructions carefully. If labeling instructions are not available, follow these general guidelines for first aid:

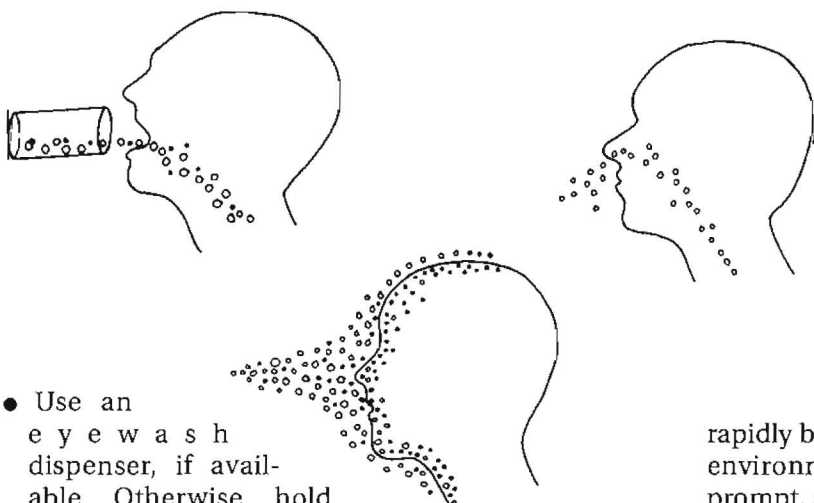
Pesticide on skin:

- Drench skin and clothing with plenty of water. Any source of relatively clean water will work. If possible, immerse the person in a pond, creek or other body of water. Even water in ditches or irrigation systems will do, unless you think they may have pesticides in them.
- Remove personal protective equipment and contaminated clothing.
- Wash skin and hair thoroughly with a mild liquid detergent and water. If one is available, a shower is the best way to thoroughly wash the entire body.
- Dry the victim and wrap in a blanket or any clean clothing on hand. Do not allow them to become chilled or overheated.
- If skin is burned or otherwise injured, cover immediately with loose, clean, dry soft cloths or bandages.
- Do not apply ointments, greases, powders or other drugs in first-aid treatment of burns or injured skin.

Pesticide in eye:

- Wash eye quickly but gently.





- Use an eye wash dispenser, if available. Otherwise, hold eyelid open and wash with a gentle drip of clean running water positioned so it flows across the eye rather than directly into the eye.
- Rinse eye for 15 minutes or more.
- Do not use chemicals or drugs in the rinse water. They may increase the injury.

Inhaled pesticide:

- Get victim to fresh air immediately.
- If other people are in or near the area, warn them of the danger.
- Loosen tight clothing that would constrict breathing.
- Apply artificial respiration if breathing has stopped or if the victim's skin is blue. If pesticide or vomit is on the victim's mouth or face, avoid direct contact and use a shaped airway tube, if available, for mouth-to-mouth resuscitation.

Pesticide in mouth or swallowed:

- Rinse mouth with plenty of water.
- Give victim large amounts (up to 1 quart) of milk or water to drink if the label directs.
- Induce vomiting only if instructions to do so are on the labeling.

Procedure for inducing vomiting:

- Position victim face down or kneeling forward. Do not allow victim to lie on his back, because the vomit could enter the lungs and do additional damage.
- Put finger or the blunt end of a spoon at the back of victim's throat or give Ipecac syrup.
- Do not use salt solutions to induce vomiting.

Do not induce vomiting:

- If the victim is unconscious or is having convulsions.
- If the victim has swallowed a corrosive poison. A corrosive

poison is a strong acid or alkali. It will burn the throat and mouth as severely coming up as it did going down. It may get into the lungs and burn there also.

- If the victim has swallowed an emulsifiable concentrate or oil solution. Emulsifiable concentrates and oil solutions may cause death if inhaled during vomiting.

Cleaning up spilled pesticides

A pesticide that is spilled on the ground can rapidly become a risk to people, livestock and/or the environment. Therefore, it is imperative that a prompt, safe and effective cleanup take place immediately after the spill occurs. Remember, do not remove personal protective equipment until the spill is completely cleaned up and the equipment is washed. Keep people and animals upwind and away from spills, fumes and drift.

Control the spill by stopping the source. For example, if the spill is due to a broken hose, close the valve or temporarily patch the hose to stop the leak. If the source is a container leak, place the leaking container in a larger, watertight container.

Contain the spill so it does not spread and get into water sources. This is done by building a levy around the spill with materials that are specially designed to stop pesticide spills from spreading. Containment materials are available from chemical dealers and should be kept on hand in case of an emergency.

Remember:
Control-Contain-Clean



Clean up the spill immediately. Absorbent materials like ground corn cobs, kitty litter or wood shavings should be spread on the spill area to soak up the pesticide. Absorbent pads are also available for this purpose. Next, the contaminated material must be shoveled into a leakproof container for proper disposal.

In the event of a large spill, call the authorities to find out how to decontaminate the area. **DO NOT** flush the area with water or use a cleaning solution until consulting with trained personnel; this helps avoid the risk of chemical reaction and ground water contamination. Call your local fire department, the Missouri Department of Natural Resources at (573) 751-7929, Chemtrec at 1-800-424-9300 or the emergency telephone number listed on the pesticide label.

Review questions

1. Harmful effects from pesticide exposure may be difficult to recognize because
 - a. pesticides cause long-term amnesia
 - b. pesticides can cause many of the same symptoms as flu and hangover
 - c. pesticides do not cause any exposure symptoms
 - d. pesticide exposures usually result in sudden death and autopsy would be required
2. In the event of a pesticide exposure, you should call:
 - a. the Missouri Department of Agriculture
 - b. the suspected pesticide's manufacturer
 - c. 911 or emergency medical personnel
 - d. the EPA
3. It is important for emergency medical personnel to have access to the pesticide label because:
 - a. they may need to know which pests that pesticide controls
 - b. it contains information on antidotes and other medical procedures
 - c. it provides instructions on setting broken bones
 - d. it instructs them on how to properly apply that product
4. The best first aid in pesticide emergencies is:
 - a. to stop the source of the pesticide exposure as quickly as possible
 - b. to force the victim to vomit
 - c. to cover the victim in blankets and not allow the body temperature to drop
 - d. to force the victim to walk in order to metabolize the toxic effects
5. In the event of a large pesticide spill, you should call:
 - a. your local fire department
 - b. the Missouri Department of Natural Resources
 - c. Chemtrec
 - d. the emergency telephone number listed on the pesticide label
 - e. any of the above can provide assistance

Pesticide Storage and Disposal

Storage

In establishing a storage site for pesticides, a correctly designed and maintained site is essential. A suitable storage site protects people and animals from accidental exposure, protects the environment from accidental contamination, prevents damage to pesticides from temperature extremes and excess moisture, protects the pesticides from theft, vandalism and unauthorized use, and reduces the likelihood of liability.

In maintaining a storage site, keep the following in mind:

- **Prevent contamination.** Store only pesticides, pesticide containers, pesticide equipment and a spill cleanup kit at the storage site. Do not keep food, drinks, tobacco, feed, medical or veterinary supplies or medication, seeds, clothing or personal protective equipment at the site. These could be contaminated by vapors, dusts, or spills and cause accidental exposure to people or animals.



- **Keep labels legible.** Store pesticide containers with the label in plain site. Costly errors can result if the wrong pesticide is chosen by mistake. Labels should always be legible. If the label is destroyed or damaged, request a replacement from the pesticide dealer or the pesticide manufacturer.
- **Keep containers closed.** Keep pesticide containers securely closed while in storage. Tightly closed containers help protect against spills, cross-contamination with other stored products, evaporation, clumping or caking of dry pesticides and contamination from dust or dirt.
- **Use original containers.** Store pesticides in their original containers. Never put pesticides in containers that might cause children or anyone to mistake them for food or drink. You are legally responsible if someone is injured by pesticides that you have placed in unlabeled or unsuitable containers.

- **Watch for damage.** Inspect containers regularly for tears, spills, leaks, rust or corrosion. When a container is damaged, use the pesticide as allowed, transfer the pesticide into another container that originally held the same pesticide or place the entire damaged container and its contents into a suitable larger container.
- **Store volatile products separately.** Vapors from opened containers can move into other nearby pesticides and chemicals. Labels of volatile herbicides usually direct the user to store them separately from seeds, fertilizers and other types of pesticides.
- **Isolate waste products.** If you have pesticides and pesticide containers that are being held for disposal, store them in a special section of the storage site. Accidental use of pesticides meant for disposal can be a costly mistake.
- **Know your inventory.** Keep an up-to-date inventory of the pesticides you have in storage. The list will help you keep track of your stock and will be essential in a fire or flood emergency. The inventory list also aids in insurance settlements and estimating future pesticide needs.
- **Consider shelf life.** Mark each pesticide container with the date of purchase before it is stored. Use older materials first.
- **Prevent pesticide fires.** Store combustible pesticides away from open flames and other heat sources. Equip each storage site with a working fire extinguisher that is approved for all types of fires, including chemical fires. If you store highly toxic pesticides or large amounts of any pesticide, work with fire department officials to develop an emergency response plan.
- **Post signs.** Wherever pesticides are stored, post signs that designate the potential hazards of the storage area on doors and windows.

DANGER - PESTICIDES
KEEP OUT!
VOLATILE MATERIALS —
NO SMOKING

Disposal

Pesticide waste. It is the responsibility of the pesticide user to see that pesticide wastes, such as unused chemicals and empty pesticide containers, are disposed of properly. There is public concern that improper disposal of pesticide wastes can create serious hazards for both humans and the environment. Empty pesticide containers are a hazard to curious children and animals. Improperly disposed pesticides can result in surface and groundwater contamination and damage to crops. It makes good business sense to deal with pesticide wastes properly and safely. Plan carefully and observe the following guidelines.

- Purchase the amount needed for one growing season.
- Always read the label for disposal instructions.
- Clothing and protective equipment to be discarded and contaminated soil or other materials used to clean up spills should be considered pesticide waste and handled as such.
- Anyone requiring assistance with pesticide disposal should contact the Missouri Department of Natural Resources for advice at (573) 751-3176.

Containers. Try to avoid disposing pesticide containers. For example, you may be able to:

- Use containers that are designed to be refilled by the pesticide dealer or the chemical company.
- Arrange to have the empty containers recycled. Contact Mo-Ag at (573) 636-6130 for a list of dealers who participate in the pesticide container recycling program.
- Use soluble packaging.

If you have containers that must be disposed, be sure to triple or pressure-rinse them. Remember, it is illegal to burn or bury pesticide containers in Missouri.

Review questions

1. A suitable pesticide storage site:
 - a. Protects people and animals from accidental exposure
 - b. Protects the environment from accidental contamination
 - c. Prevents damage to pesticides from temperature extremes and excess moisture
 - d. Protects the pesticides from theft, vandalism and unauthorized use, and reduces the likelihood of liability
 - e. All of the above
2. Pesticides should be stored:
 - a. In any container as long as it doesn't leak
 - b. Only in their original containers
 - c. In containers too heavy for children to handle
 - d. None of the above
3. If a pesticide label is destroyed while kept in storage:
 - a. Discard the pesticide
 - b. Put the pesticide on the back of the shelf
 - c. Request a new label from your dealer or manufacturer
 - d. Call the Missouri Department of Agriculture
4. The best way to dispose of a pesticide is to:
 - a. Plan ahead and purchase only the amount needed
 - b. Dump it down the sewer
 - c. Bury it in a place out of sight
 - d. Contact the Missouri Department of Agriculture
5. Who do you contact for assistance with disposal problems?
 - a. Missouri Conservation Department
 - b. Dial 911
 - c. The Missouri Department of Natural Resources
 - d. The Missouri Department of Health
6. It is legal to burn or bury pesticide containers in Missouri. (True or False)

Sprayer and Granular Applicator Calibration

It is necessary to calibrate sprayers to determine that the correct amount of pesticide and carrier is applied per acre, and to calculate the amount of pesticide and carrier to place in the tank to cover the area to be treated. Calibration refers to adjusting the application equipment to apply the correct amount of pesticide. It is determined by the amount of pesticide dispersed divided by the area covered. There are many ways to calibrate pesticide application equipment. The important message is that you choose a method that you feel comfortable with rather than trying to master them all. The following MU Guidesheets are available at your local University Outreach and Extension Center and provide detailed calibration examples and calculations:

- G1270, *Calibrating Field Sprayers*
- G1272, *Spray Mix Calculations*
- G1273, *Calibrating Granular Pesticide Applicators*

Remember, pesticides not applied at the labeled rates have costly consequences. Too little can give inadequate or unreliable control and too much can cause crop injury and environmental damage. The following are common examples of applicator calibration.

- 3. Set the working pressure for the desired spray pattern and mark the distance from Step 2 either in the field or on a similar surface.
- 4. Determine the time required to drive this distance using the tractor gear and engine rpm that will be used in the actual spraying.
- 5. Collect the output from one average nozzle for the amount of time required to drive the above distance. Be sure to use the same nozzle pressure planned for the actual application.
- 6. One ounce of output per nozzle equals 1 gallon per acre. For example, if you collected 10 ounces of liquid from the nozzle, the application rate is 10 gallons per acre.

Amount of pesticide to put into the tank

- 1. Determine how many acres a tankful will spray:
- 2. Determine the amount (oz, lb, gal, qt, pt, etc.) of pesticide to add:

$$\text{Acres covered with tankful} \times (\text{oz, lb, gal, qt, pt, etc.}) \text{ per acre} = \text{amount of pesticide}$$

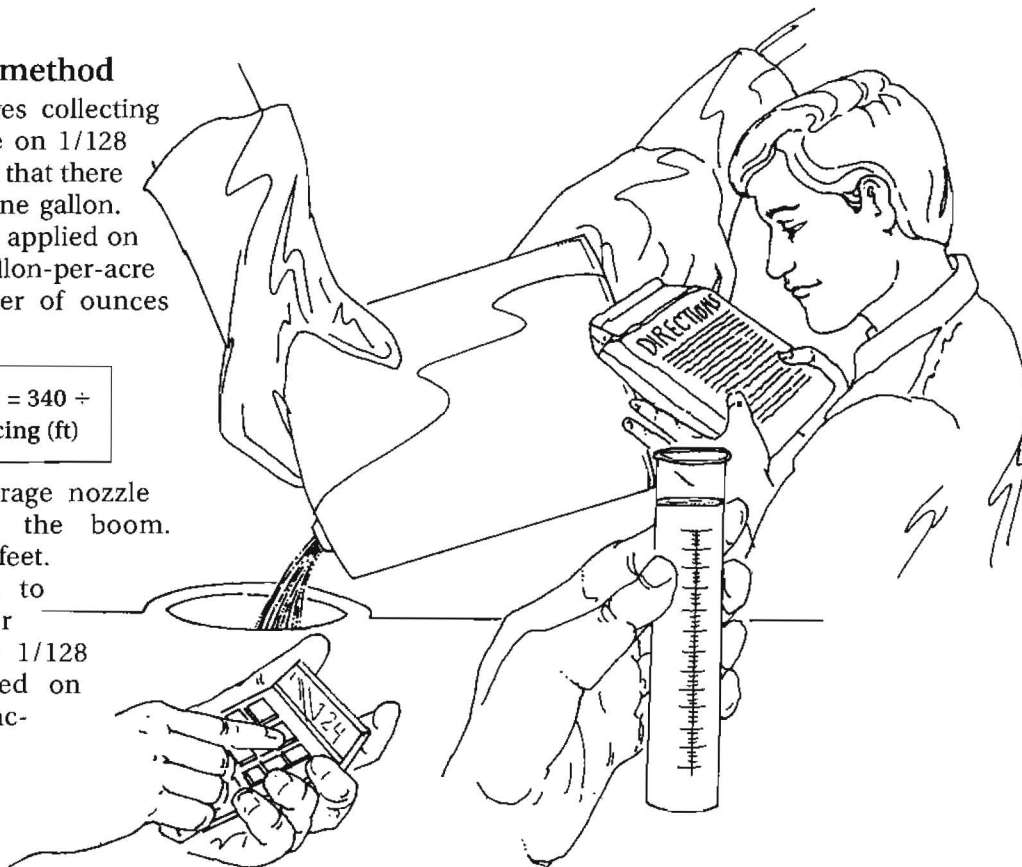
Calibrating sprayers using the 1/128-acre method

This method involves collecting the output of one nozzle on 1/128 acre. It's based on the fact that there are 128 fluid ounces in one gallon. So the number of ounces applied on 1/128 acre equals the gallon-per-acre rate. To find the number of ounces applied on 1/128 acre:

$$\text{Distance to drive (ft)} = 340 \div \text{average nozzle spacing (ft)}$$

- 1. Determine the average nozzle spacing (inches) on the boom. Convert this spacing to feet.
- 2. Find the distance to drive in the field for each nozzle to spray 1/128 acre (340 sq ft) based on the average nozzle spacing. Use this formula:

$$\text{Acres} = \frac{\text{tank capacity (gal)}}{\text{spray rate (gal/acre)}}$$

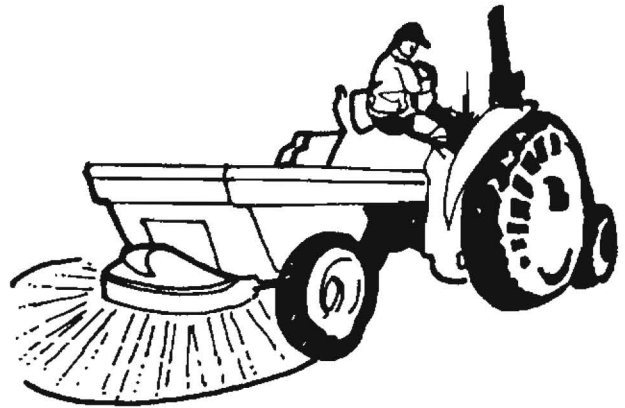
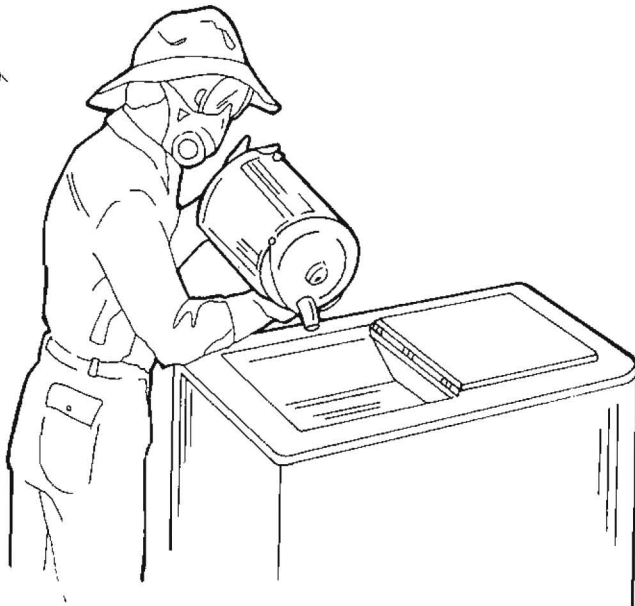


Granular applicators using the 1/100-acre method

- 1. Determine the length of row for 1/100 acre (435.6 sq ft) by using:

$$\text{Length of row (ft)} = 435.6 \div \text{row spacing (ft)}$$

- 2. Mark the distance from Step 1 in the field.
- 3. Catch granules from the tube as the tractor moves the marked distance. Weigh the sample. If the applicator is other than ground drive, you can determine the time it would take the tractor to cover the distance and catch the output for that time with the applicator sitting still.
- 4. Multiply the weight of the sample by 100 to obtain the per-acre rate. Usually with granules, the small amounts caught will be measured in ounces or grams. To convert to pounds, either (1) divide ounces by 16 or (2) divide grams by 454.



Review questions

1. _____ is adjusting application equipment to apply the correct amount of pesticide.
2. How is the application rate determined?
 - a. The number of 2.5-gallon containers purchased from your dealer
 - b. The amount of pesticide dispersed divided by the area covered
 - c. The amount of pesticide mixed into the spray tank
 - d. $\Sigma \pi N^2 P t N \div \epsilon \pm 4.56$
3. The 1/128-acre method is simple to use in calibrating a sprayer because:
 - a. It is the only method available
 - b. The local co-op uses it for their equipment
 - c. It was developed at the University of Missouri
 - d. It is based on the fact that there are 128 fluid ounces in a gallon; so, the number of ounces applied on 1/128 acre equals the gallon-per-acre rate
4. To determine how many acres a tankful will spray, it is necessary to know:
 - a. The tank capacity and the spray rate (gal/acre)
 - b. The speed of the tractor and the application pressure
 - c. The nozzle spacing and size
 - d. The temperature and relative humidity at the time of the application

Pesticide Laws and Regulations

Federal laws

The basic federal law regulating pesticides is the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). The law, first enacted in 1947, was amended in 1972. Some of the major 1972 amendments include the following:

- It brought all pesticides under federal control with provisions for allowing individual states some functions.
- It required the classification of pesticides in “general use” and “restricted use” categories. General use pesticides are those that can be purchased and used by anyone. Restricted use pesticides are pesticides that are hazardous enough to limit their sale and use only to persons who have demonstrated competence in their use (certified pesticide applicators). For a current listing of restricted use pesticides, request MU Guidesheet G7550, *Missouri Restricted-Use Pesticide List* at your local University Outreach and Extension Center.
- It required the certification of pesticide applicators using materials classified as restricted use pesticides.

Civil penalties in Missouri. A private applicator who violates FIFRA may be assessed a civil penalty of not more than \$1,000 for each violation by the director of the Missouri Department of Agriculture.

Unlawful acts in Missouri. A misdemeanor offense may be punishable through local circuit courts by imposition of a fine of not less than \$100 and not more than \$5,000 or by imprisonment in the county jail for not less than 30 days and not more than one year, or by both imposition of a fine and imprisonment.

USDA pesticide recordkeeping requirements. As of May, 1993, certified private applicators must maintain record(s) of federally restricted use pesticide applications. The record(s) must be maintained for two years following the pesticide application. What the records must contain:

- The certified applicator's name and certification number
- The month, day and year of the application
- The crop, commodity or site to which the pesticide was applied
- The brand or product name of the federally restricted use pesticide and the product's EPA registration number
- The total amount applied
- The size of the area treated
- The location of the application

More detailed information and recordkeeping forms may be obtained at your local University Outreach and Extension Center. Request MU Guidesheet MP692, *USDA Pesticide Recordkeeping Requirements for Certified Private Applicators of Federally Restricted-Use Pesticides*.

Worker protection standard. The Worker Protection Standard was issued by the EPA and applies to the use of pesticides that are used in the production of agricultural plants on farms, forests, nurseries and greenhouses. Its overall goal is to minimize applicator exposure while using the products. It also has specific guidelines to help reduce pesticide exposure to field workers that may be in treated fields. Protective clothing and equipment requirements were increased. REI's are established for each pesticide product. For further details, request *The Worker Protection Standard for Agricultural Pesticides - How to Comply* at your local University Outreach and Extension Center.

Missouri laws

To assure that Missouri's farmers will continue to have access to essential and commonly used pesticides, the Missouri Pesticide Use Act was passed. This legislation gives the director of agriculture authority to certify private applicators (farmers) as required by the federal law and to prescribe standards for certification. The certification of pesticide applicators is administered by the Missouri Department of Agriculture's Bureau of Pesticide Control. Four types of certified applicators exist under the law:

- **Commercial applicator.** These are individuals who use, supervise, or determine the need of any pesticide on the lands of another as a service to the public in exchange for a fee or compensation.
- **Noncommercial applicator.** Individuals who use or supervise the use of restricted use pesticides only on lands owned or rented by themselves or their employers.
- **Private applicator.** Individuals who use or supervise restricted-use pesticides to produce an agricultural commodity on their own, their employer's land, or on lands rented by them. Legal age is 18 years.
- **Public operator.** Individuals who use or supervise restricted-use pesticides as employees of federal, state, county or local government agencies.

For a copy of the Missouri Pesticide Use Act or questions concerning Missouri laws and regulations, contact:

Missouri Department of Agriculture
Division of Plant Industries
Bureau of Pesticide Control
P.O. Box 630
Jefferson City, MO 65102
Telephone: (573) 751-2462

Endangered Species Act. The Endangered Species Act is intended to protect and promote recovery of animals and plants that are in danger of becoming extinct due to human activities. Under the Act, the EPA must ensure that use of pesticides will not result in harm to the species listed as endangered or threatened by the U.S. Fish and Wildlife Service, or to habitat critical to those species' survival. To implement the Endangered Species Protection Program, labels of certain pesticides direct users to county-specific informational bulletins available at University Outreach and Extension Centers. The bulletins show and describe the affected area(s) of the county, the species name and lists active ingredients that have limited use. At this time, specific areas of 33 Missouri counties are affected by the program. To date, this program is voluntary.

Missouri Pesticide Use Act



Missouri Department
of Agriculture
Division of Plant Industries
Bureau of Pesticide Control
P.O. Box 630
Jefferson City, MO 65102

Review questions

1. The basic federal law regulating pesticides is referred to as _____.
2. Restricted use pesticides may be purchased and used only by:
 - a. Persons at least 21 years of age
 - b. Any person as long as they are a U.S. citizen
 - c. Certified applicators
 - d. Private industry personnel
3. The USDA Pesticide Recordkeeping Requirement requires private applicators to:
 - a. Maintain records of all pesticide applications
 - b. Maintain records of restricted-use pesticide applications
 - c. Have their dealers keep records for them
 - d. Contact the Missouri Department of Agriculture following an application
4. The Worker Protection Standard applies to:
 - a. Local Union 497 in St. Louis
 - b. The use of agricultural pesticides
 - c. Those who are supposed to wear respirators
 - d. Only restricted use pesticides
5. In Missouri, the certification of pesticide applicators is administered by:
 - a. The Missouri Department of Natural Resources
 - b. The EPA
 - c. The University of Missouri
 - d. The Missouri Department of Agriculture
6. The Endangered Species Program:
 - a. Applies to the entire state
 - b. Is voluntary and applies to portions of 33 Missouri counties
 - c. Limits the use of all pesticides in endangered species habitats
 - d. Does not apply to Missouri at this time

Answers to Review Questions

Principles of Pest Control

1. False
2. True
3. Integrated Pest Management
4. Natural controls
 - Host resistance
 - Biological control
 - Cultural control
 - Mechanical control
 - Sanitation
5. Pest resistance
 - Applied at wrong time
 - Pest not present
 - Pest stage not susceptible
 - New infestation

Pesticides in the Environment

1. Environment
2. Point source
 - Non-point source
3. In air (drift)
 - In water (runoff or leaching)
 - On objects, plants or animals
4. b
5. Residue

The Pesticide Label

1. Warning
2. 1 Tsp to 1 Tbsp
3. Imaguwanafop
4. Flush with water for 15 min. and get medical attention
5. 115°F

Protect Yourself From Pesticides

1. Toxicities and exposure
2. False
3. False
4. d
5. d

Emergency Response and Spills

1. b
2. c
3. b
4. a
5. e

Pesticide Storage and Disposal

1. e
2. b
3. c
4. a
5. c
6. False

Sprayer and Granular Applicator Calibration

1. Calibration
2. b
3. d
4. a

Pesticide Laws and Regulations

1. FIFRA
2. c
3. b
4. b
5. d
6. b

Emergency Telephone Numbers

Missouri Regional Poison Control Center

1-800-366-8888

For pesticide poisoning emergencies, the Missouri Poison Control Center is accessible through a toll-free number. The center is located and administered by Cardinal Glennon Memorial Hospital in St. Louis. It is staffed 24 hours daily with medical professionals. The center is equipped to refer poisoning accident victims to a local poison control emergency facility.

Missouri Emergency Response Team

(573) 634-2436

For pesticide spill emergencies, the Emergency Response Team handles pesticide spills anywhere in Missouri. For information, call (573) 751-7929. Contact: Environmental Emergency Response Coordinator, Missouri Department of Natural Resources, Division of Environmental Quality, P.O. Box 176, Jefferson City, MO 65102.

National Pesticide Safety Team Network (Chemtrec)

1-800-424-9300

The National Agricultural Chemicals Association has a telephone network. This network can tell the applicator the correct contamination procedures to use to send a local safety team to clean up the spill. An applicator can call the network toll free at any time.

National Pesticide Tele-Communications Network

1-800-858-PEST

Call the NPTN network toll free.

U.S. Environmental Protection Agency (EPA)

(913) 551-7000

All major pesticide spills must by law be reported immediately to the U.S. Environmental Protection Agency, Region VII Office, 726 Minnesota Avenue, Kansas City, KS 66101. The following information should be reported:

1. Name, address, and telephone number of person reporting
2. Exact location of spill
3. Name of company involved and location
4. Specific pesticide spilled
5. Estimated quantity of pesticide spilled
6. Source of spill
7. Cause of spill
8. Name of body of water involved, or nearest body of water to the spill area
9. Action taken for containment and cleanup



■ Issued in furtherance of Cooperative Extension Work Acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. Ronald J. Turner, Director, Cooperative Extension, University of Missouri and Lincoln University, Columbia, MO 65211. ■ University Outreach and Extension does not discriminate on the basis of race, color, national origin, sex, religion, age, disability or status as a Vietnam era veteran in employment or programs. ■ If you have special needs as addressed by the Americans with Disabilities Act and need this publication in an alternative format, write ADA Officer, Extension and Agricultural Information, 1-98 Agriculture Building, Columbia, MO 65211, or call (573) 882-7216. Reasonable efforts will be made to accommodate your special needs