

CHAPTER 10

PLANNING THE PESTICIDE APPLICATION

LEARNING OBJECTIVES

After studying this chapter, you should:

- Know how to select appropriate pesticides and additives.
- Know how to review pesticide label information and understand the legal restrictions pertaining to an application, including avoiding non-target organisms and surfaces.
- Know how to determine if two or more pesticides may be tank mixed.
- Know how to follow the label for safe mixing and loading.
- Understand how to prevent contamination of groundwater, surface water, or irrigation water by pesticides during mixing, loading, and cleaning.
- Know what PPE to wear during mixing, loading, and cleaning.
- Know how to measure pesticides accurately using the proper measuring device.
- Know how to open pesticide containers and transfer contents safely.
- Know how to rinse and dispose of pesticide containers properly.
- Know how to ensure that the pesticide is being applied correctly.
- Know how to clean and properly store application equipment after use.



Careful planning and consideration of all details are necessary before starting a pesticide application. Planning the pesticide application requires knowing how to select the appropriate pesticide for the job and then carefully reviewing the label. Other factors involved in

correct pesticide application procedures include knowing how to test for pesticide compatibility prior to mixing; what PPE to wear during mixing, loading, and cleaning; how to transfer pesticide contents safely; and how to clean up after an application.

SELECTING THE PESTICIDE



Tom Bowman, Virginia Tech Pesticide Programs

Always read the label before applying the pesticide.

Before selecting a pesticide for a particular application, you need to know whether it is the right pesticide for your particular pest management needs, whether the pesticide can be used safely under your application conditions, and how much product you need for the area you are treating.

Before applying the pesticide, read the label to determine:

- What safety measures must be followed.
- Where you can legally use the pesticide (e.g., target sites).
- When to apply the pesticide. Consider such factors as the life cycle of the pest, weather conditions, the preharvest and grazing interval, and the rotational or replanting interval.
- How to apply the pesticide properly (including selecting equipment and following label directions).
- If any special use restrictions

apply, such as reentry into a treated area or prohibitions against certain types of application methods or equipment.

- Whether restrictions apply on the use of the pesticide, such as environmental conditions, setbacks or buffers, and drift warnings.

Some labels call for the addition of an adjuvant (or additive) to the spray mixture. This may be an **emulsifier**, which allows two unlike liquids (such as oil and water) to be uniformly mixed; a **spreader** or **surfactant** to allow for more thorough coverage over the target plant or insect; a **sticker** to help keep the pesticide on the treated site longer; or a **penetrant** to help the pesticide pass through the outer surfaces of plant leaves and stems or insect cuticle. **Drift control additives** increase the size of the spray droplets. **Defoaming agents** eliminate foam in the spray tank. Other types of additives include **invert emulsifiers** and **buffers**. (See Chapter 4 for a more detailed discussion of spray adjuvants.)

REVIEWING THE PESTICIDE LABEL

It is important to review the label carefully. Immediately under the heading *Directions for Use* is the statement: ***It is a violation of federal law to use this product in a manner inconsistent with its labeling.*** This statement, which must appear on all EPA-registered pesticide products, emphasizes that the pesticide must be used as directed on the product label.

The directions for use indicate the various crops, animals, or sites on

which you may legally use the pesticide. It is important to follow the use instructions on the label for the specific crop, animal, or site being treated. Under the subheading for specific crops, sites, or animals to be treated, the label lists the target pests, application rates, and general application methods. Also consult the label on proper storage and disposal of the pesticide and empty containers.

COMPATIBILITY OF PESTICIDES

Tank mixing two or more pesticides saves time and labor and reduces equipment and application costs. In some cases, however, it can alter the

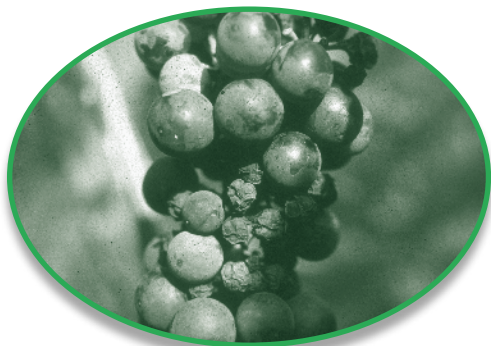
effectiveness of one or more of the products.

Two or more pesticides are considered **compatible** when they can

be mixed and applied in combination without adversely affecting the effectiveness or the physical and chemical properties of the mixture, or causing undesirable damage to the application site. When problems develop from mixing two or more products together, the chemicals are considered **incompatible**. Incompatibility can be a matter of timing or placement of the pesticides. Chemical or physical incompatibility may occur between the pesticides.

Timing incompatibility occurs when two or more pesticides are not equally effective in controlling pests at the time of application. For example, a preemergence herbicide applied to control germinating weed seeds would be incompatible with a herbicide best applied just after the emergence of weeds later in the season.

Placement incompatibility occurs



In this example of timing incompatibility, a mixture of a fungicide and insecticide was applied at the same time. The insecticide was applied at the right stage of development to control a moth pest but the fungicide was applied too early to control the fungal disease on grapes.

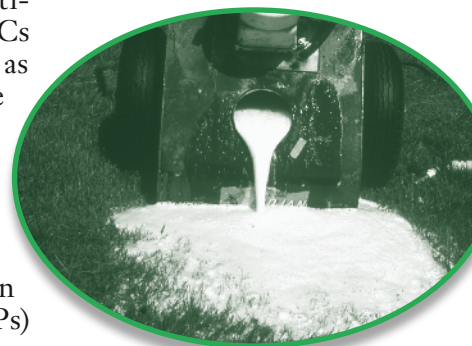
when two or more pesticides need to be handled by different application methods, even though the timing is the same. For example, some herbicides must be incorporated into the soil, while others must remain on the soil surface.

Physical incompatibility is the failure of the products to stay uniformly mixed in the spray tank. Physical incompatibility may result in a putty or paste formation, a separation into layers, or a cottage cheese-looking mixture (precipitates) that may clog screens and nozzles and be useless in controlling target pests.

Physical incompatibility may be caused by improper mixing procedures, inadequate agitation, lack of stable emulsifiers in some emulsifiable concentrates (EC), or the combination of incompatible products. Physical incompatibility problems may also occur when mixing combinations of pesticides with liquid fertilizers. Some ECs are not stable in saline solutions such as fluid fertilizers. A few pesticides are available in special fertilizer-grade formulations that reduce compatibility problems. Other physical incompatibility problems may occur when pesticides are mixed with hard water (water with a pH greater than 7.0). When wettable powders (WPs) and ECs are improperly mixed in a tank, a putty or paste may form at the bottom, or an oily layer may float to the top of the mixture.

Chemical incompatibility occurs when mixing certain pesticides in the spray tank alters the activity of one or more of them. In other words, a chemical reaction takes place. The resulting mixture is different from the products applied separately. There are two types of chemical incompatibility. In the first type, the pesticidal activity of at least one of the components is reduced when two or more products are mixed. This is more likely to occur when the applicator is using hard water, chlorinated water, or fertilizers in the mixture. Before using a new water source or adding fertilizer, check the compatibility with the pesticides you are using (see "Conducting a Physical Compatibility Test"). In the second type, the activity of two or more products applied together may be greater than if the individual pesticides were applied separately. This added effectiveness can result in losing the selective nature of the individual products and may cause undesirable damage.

Pesticide labels may provide directions for avoiding chemical incompatibility in the spray tank. If product mixtures are known to tank mix without concern, the



Physical incompatibility results in an unsprayable mixture, in this case, excessive foaming.



In this case of chemical incompatibility, mixing pesticides reduced their effectiveness, allowing weeds to grow along with the corn.

label may specifically mention this. When mixing chemicals that are not listed as compatible products on the label, determine whether the products are chemically and physically compatible before mixing them in the spray tank. Remember, it is illegal to mix pesticides with other products (for example, other pesticides, adjuvants, or carriers) when such mixtures are expressly prohibited on the label.

Conducting a Compatibility Test

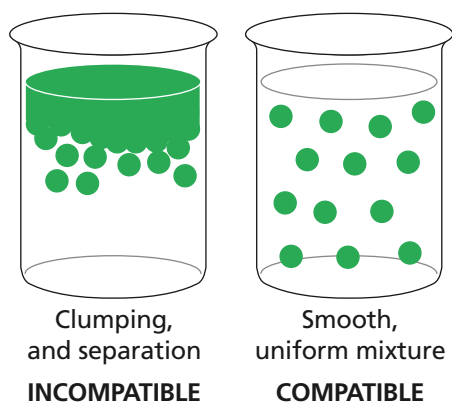
The best way to determine if products can be tank mixed is to read the label. Most labels, however, do not indicate whether products can be safely mixed. In this case, use a jar test to test for chemical and physical incompatibility. To conduct a jar test, use a small glass or plastic container and mix proportionate amounts of all the carrier and products you intend to mix in the spray tank. Start by filling the jar one-fifth to one-half full with the carrier (water or liquid fertilizer). Then add proportionate amounts of each of the products, one at a time, in the order suggested under “Making Tank Mixes.” Shake the jar thoroughly after each product is added. Allow the mixture to stand for 10 to 15 minutes. If flakes, sludge, gel, precipitates, or other solids form, if the products separate into layers, or if heat is given off, the products cannot be safely tank-mixed. In some

cases, adding compatibility agents may improve the mixing of the ingredients.

Making Tank Mixes

To minimize compatibility problems with tank mixes, follow correct mixing procedures. The usual method for tank mixing pesticides is to fill the spray tank one-fifth to one-half full with the carrier (usually water or liquid fertilizer) before adding any pesticide or adjuvant. Then begin agitation. If the label calls for a compatibility agent like a buffer, add it before other products. Add and thoroughly mix the products, one at a time, beginning with those hardest to mix. Generally, dry products such as wettable powders (WP), dry flowables (DF), or water-dispersible granules (WDG) are added first to produce a suspension in the tank. Then add liquid suspensions such as flowables (F)/liquids (L), and microencapsulated (ME) formulations. Next, add the solution (S) and soluble powder (SP) formulations. Add any surfactant or other adjuvant after the suspension and solution products. Be careful and always add the emulsion products (EC) last.

Thoroughly mix each product before adding the next one. To ensure thorough mixing of dry formulations before adding them to the mixture, make a preslurry—mix them with a little water to form a paste before adding them to the tank mix. To make certain you have a uniform spray mixture at all times, keep the mixture agitated during the entire application until the tank is empty.



Adapted from *The Safe and Effective Use of Pesticides*, University of California

A jar test indicates whether two or more pesticides can be safely mixed.

Tank Mixing Order

1. Fill tank one-fifth to one-half full with carrier (water or liquid fertilizer). Start agitation.
2. Add compatibility agent (if needed).
3. Add suspension products: first, dry formulations—wettable powders (WP), dry flowables (DF), water-dispersible granules (WDG) (as a preslurry, if necessary), then liquids—flowables (F), liquids (L), microencapsulated (ME).
4. Add solution products—solutions (S), soluble powders (SP).
5. Add surfactants or other adjuvants (if needed).
6. Last, add emulsion products—emulsifiable concentrates (EC).

SAFE MIXING AND LOADING PRACTICES

Handlers who mix and load concentrated pesticides have an especially high risk of accidental exposure and poisoning. Observe the following simple precautions to reduce the risks involved with this part of the job.

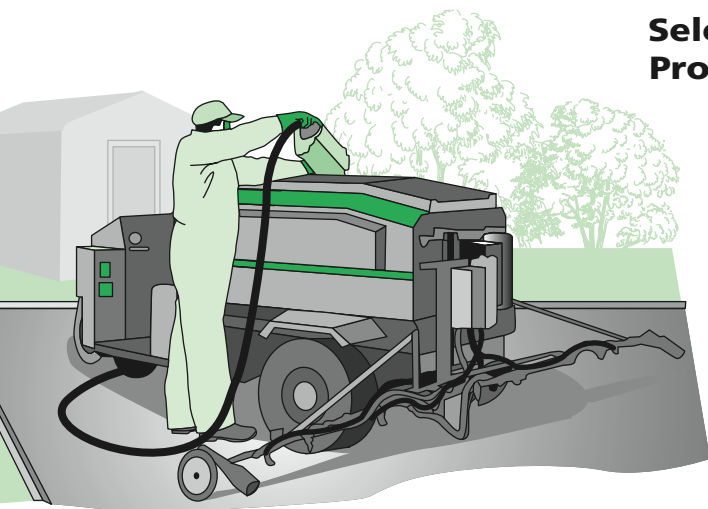


Jack Kelly Clark, University of California Statewide IPM Program

Observe all precautions when mixing and loading pesticides.

Select an Appropriate Mixing/Loading Area

Locate the pesticide mixing and loading area outdoors or indoors in a well-ventilated, well-lighted area away from unprotected people, animals, food, and other items that might be contaminated.



Locate the pesticide mixing and loading site outdoors or in a well ventilated area.

Protect Water Sources

When mixing, ensure that no tank mixture can back-siphon into a water source. When filling using a water pipe or hose, place the pipe or hose end well above the surface of the pesticide mixture, leaving a distinct air gap between the two. An air gap prevents contamination of the hose and keeps pesticides from back-siphoning into the water source if a drop or loss of water pressure occurs. If water is pumped directly from the source into a mix tank, use a check valve, antisiphoning device, or backflow preventer to prevent back-siphoning if the pump fails. The backflow preventer has a mechanism that automatically closes if a drop or loss of water pressure occurs. Check valves are crucial for **chemigation** and similar systems where pesticides are injected into irrigation water.

Mix pesticides in areas where any spills, leaks, and overflows cannot flow toward a drain or into water sources. It may be necessary to use a containment pad (see Chapter 11). If using a permanent mixing and loading site, use a mixing/loading pad. When possible, mix and load the pesticides at the application site, being careful not to use the same site repeatedly and not to contaminate any water sources.

Select Personal Protective Equipment (PPE)

Put on the appropriate PPE before opening a pesticide container. Pesticide handlers must use all PPE that the pesticide labeling requires.

- **Body protection**—If splashing may occur during mixing or loading tasks, or if you come in direct contact with contaminated equipment, consider wearing a bib-top apron made of butyl, nitrile, or foil-laminate material. The style that includes built-in gloves and sleeves is especially protective.



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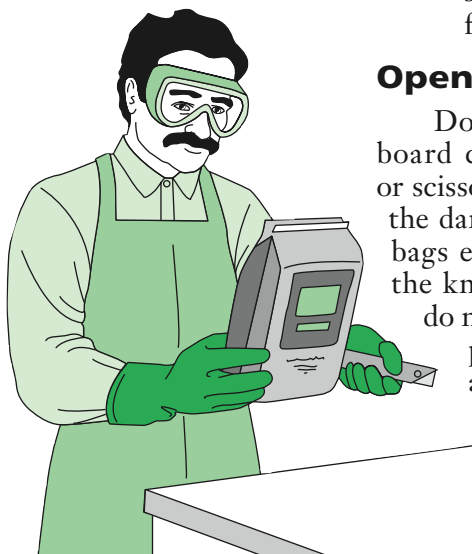
Leave a distinct air gap between the hose and the surface of the pesticide mixture to prevent back-siphoning.



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Use a backflow device when water is pumped directly from the source.

- **Face protection** — When pouring liquid pesticides or adding dry pesticides to a liquid, consider wearing a faceshield to keep splashes and dusts off the face, nose, and mouth.
- **Respiratory protection** — When handling pesticides, choose the appropriate respirator with the NIOSH code specified on the label. Also wear eye protection, such as shielded safety glasses, goggles, or a faceshield.



Use a sharp knife to open pesticide bags and wear appropriate PPE.

Opening Containers

Do not tear open paper or cardboard containers. Use a sharp knife or scissors to open them. This reduces the danger of spilling and also makes bags easier to close after use. Clean the knife or scissors afterwards, and do not use it for other purposes. To prevent spills, close containers after each use. Even if you plan to mix more of the same pesticide, close the container tightly each time. Be sure to wear the appropriate PPE when handling pesticide containers.

Measuring

Liquids and some granular pesticides are measured by volume; dusts, powders, and most dry formulations are measured by weight.

Pesticide labels use the English system of measurement—i.e., fluid ounces, pints, quarts, and gallons for liquids, and pounds and ounces for dry materials.

The pesticide handler needs an assortment of glass or plastic measuring utensils, from 1 cup to 1 gallon, for accurately measuring liquids. Some pesticides react with metal, especially aluminum and iron, so avoid using metal measuring utensils. Use an eye-dropper to measure small quantities of

liquids. Use an accurate scale and a set of measuring cups and spoons for measuring and weighing dry pesticides. Mark each pesticide measuring item clearly to avoid using it for other purposes. To avoid accidental poisonings, paint handles with brightly colored waterproof paint or attach waterproof warning labels. When you are not using them, keep all measuring and weighing equipment and utensils locked in the pesticide storage area. After each use, clean and wash utensils before storing them to prevent contaminating future mixtures.

Transferring Pesticides

After measuring or weighing the correct amount of pesticide, carefully add it to the partially filled spray tank. When pouring any pesticide from its container, keep the container and pesticide below face level. If there is a breeze outdoors or strong air currents indoors, stand so the pesticide cannot blow back on you. Rinse the measuring container thoroughly and pour the rinsate into the spray tank. Use caution while rinsing to prevent splashing. Never leave the spray tank unattended while it is being filled.

When transferring wettable powders, dusts, or other dry formulations, avoid spillage and inhalation of dusts.



Jack Kelly Clark, University of California Statewide IPM Program

Accurately measure pesticides.

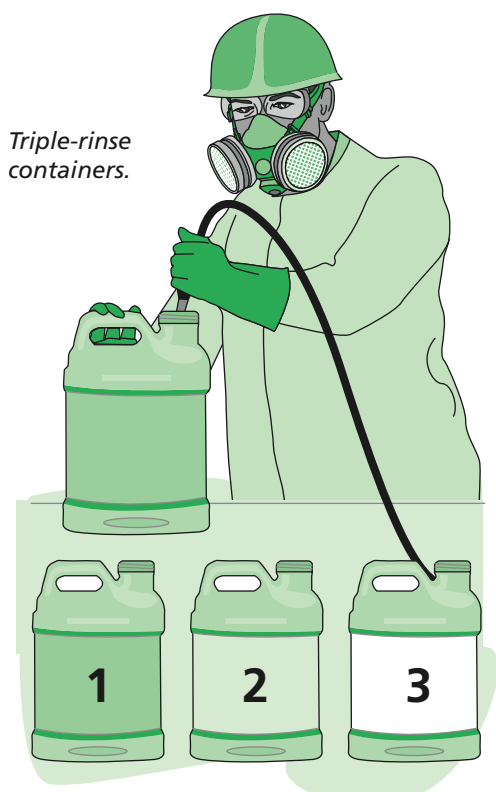


Virginia Tech Pesticide Programs

When transferring wettable powders, dusts, or other dry formulations, avoid inhalation of dusts.

CLEANING AND DISPOSING OF PESTICIDE CONTAINERS

There are two types of pesticide containers: **rinsable** and **non-rinsable**. Rinse empty rinsable plastic containers immediately because the residues can dry quickly and become difficult to remove. When rinsing, add the rinsate to the spray tank as part of the pesticide mixing process. **Triple-rinsing** or **pressure-rinsing** empty pesticide containers allows them to be disposed of as non-hazardous waste. Clearly mark and puncture rinsed containers and safely store them for later recycling or disposal.



Triple-rinse containers.

Adapted from Penn State Pesticide Education Manual

Non-rinsable containers include bags and boxes of dry pesticides and aerosol cans and cylinders. Empty them as completely as possible. Some containers are designed to be returned to the pesticide dealer or manufacturer for refilling.

If empty pesticide containers cannot be refilled, reconditioned, recycled, or returned to the manufacturer, crush, break, or puncture them to make them unusable except in the case of aerosol cans. Do not leave pesticide

containers unattended at the mixing, loading, or application site—return them to a secured storage area until they can be recycled or disposed of properly. Dispose of containers in accordance with label directions and with federal, state, and local laws and regulations. Do not reuse pesticide containers or tamper with containers designed to be returned and refilled. Check with your state, territorial, or tribal pesticide regulatory agency to determine if your area has a container recycling program.

Container Rinsing Procedures

To triple-rinse a container, wear protective clothing and follow these steps:

1. Allow the concentrate to drain from the empty pesticide container for 30 seconds.
2. Fill approximately 20 percent of the container volume with water, replace the lid, and shake the container so all the interior surfaces are rinsed.
3. Drain the rinse water into the spray tank, allowing it to drain for at least 30 seconds.
4. Repeat the procedure two more times.

Pressure-rinsing is an effective way to make a pesticide container non-hazardous. Pressure-rinsing requires the use of a special nozzle that directs water under high pressure into the container. Check with your chemical dealer for availability of these nozzles. Studies have indicated that pressure-rinsing is as effective as triple-rinsing and it can take less time. Puncturing the container with the rinse nozzle also renders the container unusable.

To pressure rinse a container, wear



Larry Schulze, University of Nebraska

A pesticide container recycling center.



Purdue Pesticide Programs

Pressure rinsing directs high-pressure water into the container.

protective clothing, especially gloves and goggles or a faceshield, and follow these steps:

1. Allow the concentrate to drain from the empty pesticide container for 30 seconds.
2. While holding the container over the spray tank in a draining position, push the pointed pressure-
3. Pressure-rinse the container for at least 30 seconds, draining the rinse water directly into the spray tank.
4. Thoroughly rinse the container cap with a slower flow of water, capturing the rinse water in the spray tank.

APPLYING PESTICIDES CORRECTLY

Applicators have several important responsibilities when applying pesticides—protecting themselves, others, the environment, and making sure the pesticide is applied correctly. Applicators must be sure to use the proper PPE and follow the correct application procedures.

Personal Protective Equipment (PPE)

By law, applicators must wear the PPE and other clothing the pesticide labeling requires. Consider using additional protection for some types of pesticide application tasks.

Hand-carried and backpack applications—Exposure is quite likely to occur when pesticides are applied using hand-held application equipment or dust shakers. Dripping or partially clogged nozzles, leaky hoses, or loose equipment connections are other potential sources of exposure. Consider wearing extra PPE to protect the areas of your body that will be in contact with the equipment.

Many applications performed while on foot cause the applicator to walk into the path of the pesticide being applied. Whenever possible, apply pesticides so you are backing out of the treated area. If you must walk into the path of the pesticide, consider wearing shin-high or knee-high rubber boots, or other protective footwear with chemical-resistant pants. Wear appropriate protective clothing and equipment when entering treated areas to fix clogged nozzles or other malfunctioning equipment parts.

High-exposure applications—

Certain types of pesticide applications pose a special risk because they may expose the applicator to large amounts of pesticide. These include:

- Mist blower or airblast sprayers.
- Aerosol and fog generators.
- High-pressure sprayers and power dusters.
- Equipment that directs applications over your head, such as to tree canopies or roof eaves.



M.J. Weaver, Virginia Tech Pesticide Programs

Wear appropriate protective PPE whenever you must walk into the path of a pesticide application.



Tom Bowman, Virginia Tech Pesticide Programs

This high pressure spray application in a Christmas tree plantation requires more PPE than the label has listed.

Pesticide exposure is quite likely whenever you are working in these situations. Therefore, consider wearing more PPE than the pesticide label requires. A chemical-resistant suit with a hood and gloves, footwear with sealed cuffs, and a full-face respirator or half-face respirator with sealed goggles can provide adequate protection for these high-exposure applications.

Pesticides are sometimes applied in enclosed spaces such as warehouses, factories, restaurants, and homes; railcars, and ship and truck cargo areas; silos, elevators, and other grain storage areas; and greenhouses. Applying pesticides in enclosed spaces increases the risk of inhalation and dermal exposure. Consider using a respirator and additional protective clothing even if you would not need it for the same application outdoors.

Application Procedures

To ensure pesticides are being applied properly, follow these basic procedures:

1. Before applying a pesticide, clear all people and pets from the area. Remove toys and pet dishes from the application area, and cover garden furniture, swimming pools, and birdbaths. Even when the pesticide application is a narrowly directed one, such as a crack and crevice treatment, keep people and animals out of the immediate area during the application. Check the pesticide label to find out when they can go back into the application area. If the label does not include specific restricted-entry statements, keep people and non-target animals out of the treated area until the spray has dried or the dust has settled.
 2. Take the time to be sure that the pesticide is reaching the
- surface or area toward which you are directing it. In the case of granules, make sure they are removed from non-target areas such as sidewalks.
 3. Apply the pesticide evenly and in the correct amounts. Do not allow liquid pesticides to form puddles or dry pesticides to pile up in the application area. Be especially careful in areas where you turn or pause your equipment. You may have to shut off your equipment in these areas. After the pesticide is applied to the first part of the target site, check to be sure the correct amount of pesticide has been used.
 4. Ensure that the pesticide maintains a uniform mix or appearance during the application. Several pesticide formulations mixed with liquid require agitation to remain in suspension. Granules and dusts should appear dry and not form clumps on the target site.
 5. Check hoses, valves, nozzles, hoppers, and other equipment parts often during the application.
 6. Turn equipment off when you pause for any reason. Agitation must be maintained if the spray mix is a suspension of particles (such as wettable powders, flowables, or dry flowable formulations). When you stop an application for any reason, depressurize spray tanks. Turn off the main pressure valve on the tank and release the pressure remaining at the nozzles.
 7. Check the label for any postapplication requirements, such as incorporating the pesticide into the soil.

AFTER MIXING, LOADING, AND APPLICATION

After mixing, loading, or applying a pesticide, you need to perform a few important follow-up tasks. Take the

time to clean the pesticide equipment and yourself properly. While the facts of the application are still fresh in your

mind, record all information about the application for future reference needs and to comply with all federal and state pesticide record-keeping laws.

Always clean all mixing, loading, and application equipment as soon as you finish. Do not leave equipment containing pesticides at the mixing and loading site or at the application site. Avoid washing equipment repeatedly in the same location unless you use a containment pad or tray.

Instruct persons who clean pesticide-contaminated equipment on proper safety procedures. Equipment cleaning presents as great a risk of exposure to pesticides as do many other pesticide handling tasks. When cleaning pesticide-contaminated equipment, wear the same PPE that the labeling requires for making applications, plus a chemical-resistant apron or other appropriate protective equipment. Also consider wearing eye protection even if not required by the label.



USDA

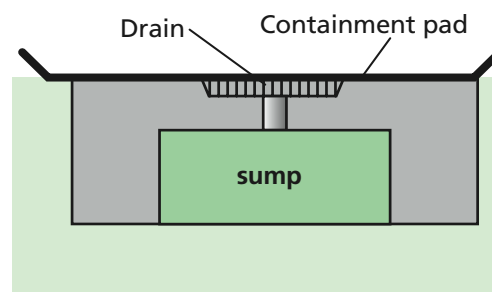
Be sure to wear appropriate PPE when cleaning application equipment.

Cleaning Procedures

After the equipment is empty, clean both the inside and the outside thoroughly, including nozzles or hopper openings. Certain pesticides use a carrier (e.g., petroleum-based products) that may require special cleaning agents or high water pressure to get the equipment clean.

Rinsates—Rinsates from equipment that has been cleaned contain pesticides and can be harmful to people and the environment. Do not allow rinsates to flow into water systems, including sink or floor drains, storm sewers, wells, streams, lakes, or rivers. Collect rinsates and apply them to labeled sites at or below labeled rates. If possible, consider rinsing your equipment at the application site and applying the rinsate to the labeled site.

Equipment rinsate may also be used as a diluent for future mixtures of pesticides if:



A mixing and washing pad may require a sump that can be pumped out to collect rinsate after each use.

- The pesticide in the rinsate is labeled for use on the target site where the new mixture is to be applied.
- The amount of pesticide in the rinsate plus the amount of pesticide product in the new mixture does not exceed the label rate for the target site.
- The rinsate is used to dilute a mixture containing the same or a compatible pesticide.

The rinsate **cannot** be added to a pesticide mixture if:

- The rinsate contains strong cleaning agents, such as bleach or ammonia, that might harm the plant, animal, or surface to which the pesticide will be applied.
- The rinsate would alter the pesticide mixture and make it unusable; for example, if the pesticides are physically or chemically incompatible.

If rinsates cannot be used, dispose of them as you would waste pesticides.

Equipment cleanup—Clean your equipment thoroughly after each use or when changing chemicals. Pesticide residues in a spray tank may corrode metal, plug hoses, or damage pumps and valves unless they are removed immediately after use. Sometimes residues react with pesticides used later, reducing the effectiveness of the pesticides. Special tank-cleaning nozzles are available for cleaning the interior walls of spray tanks.

Collect rinsate and apply to a labeled site at or below labeled rates.

Thoroughly rinse equipment with a water-detergent solution (8 to 16 ounces of detergent in 30 to 40 gallons of water). Allow the water-detergent solution to circulate through the system for several minutes. Remove the nozzles and screens, and flush the sprayer system twice with clean water.

Sloppy cleanup practices are one of the main causes of equipment failure or malfunction. Pesticides allowed to dry in the application equipment tend to clump and stick and cannot be easily removed.

Several commercial compounds are available to aid in tank cleaning. These can neutralize and remove pesticide residues, remove mineral deposits and rust, and leave a protective film on tank walls to help prevent corrosion.

When preparing to store your sprayer, add 1 to 5 gallons of lightweight oil (how much depends on the size of the tank) before the final flushing. As water is pumped from the sprayer, the oil leaves a protective coating on the inside of the tank, pump, and plumbing. To prevent corrosion, remove nozzle tips and screens and store them in a can of light oil such as diesel fuel or kerosene. In addition, add a small amount of oil and rotate the pump four or five

revolutions by hand to coat interior surfaces completely. Engines, whether air- or water-cooled, require additional servicing. Follow the directions in the owner's manual.

After thoroughly cleaning and draining the equipment, store it in a dry, clean building. Replace worn-out, deteriorated, or broken parts. If you store the sprayer outside, remove the hoses, wipe them clean of oil, and store them inside where they will not become damaged. When using trailer sprayers, you may want to put blocks under the frame or axle to reduce tire pressure during storage.

As with any procedure involving pesticides, remove contaminated clothes and take a shower immediately after cleaning equipment. Waiting until the end of the day to clean up can allow additional absorption of the pesticide through the skin. Never wear contaminated clothing under any circumstances. Keep contaminated clothing separate from other laundry and tell the person who washes the clothes of the possible hazards. Encourage him/her to wear protective gloves while doing the laundry. Dispose of contaminated clothing as hazardous waste if it cannot be decontaminated.



Take a shower immediately after using pesticides.

SUMMARY

Applying pesticides correctly requires careful planning. The user must be able to review and understand the label information to select the appropriate pesticide for the job. By law, the applicator must adhere to the label directions. Making tank mixes of pesticides can save time, labor, and costs. Labels do not always specify whether products can be tank mixed. Therefore, it is important that applicators know how to conduct a compatibility test to determine which products can be safely mixed. Following the appropriate tank mixing order can also help reduce compatibility problems.

Safe mixing and loading practices include selecting an appropriate mixing/loading area, protecting water sources, and selecting appropriate PPE. Be sure to open, measure, and transfer

the pesticide as safely as possible and adhere to all label directions on mixing and loading. Pesticide users must also properly dispose of empty pesticide containers. Rinsable containers must be triple- or pressure-rinsed, disposed of, or recycled. Empty non-rinsable containers as completely as possible before disposing, recycling, or refilling.

Procedures must be in place to ensure pesticides are being applied properly. Remember, to protect yourself and the surrounding environment, wear the appropriate PPE and remove all people and pets from the area. Wear all the PPE required by the label. Consider wearing additional PPE under high exposure applications.

After mixing, loading, and applying pesticides, be sure to clean equipment and yourself properly.

Poor equipment cleanup practices may lead to equipment failures. To avoid environmental contamination, reuse application equipment rinsates used to clean as a diluent in a spray mixture containing the same or a compatible pesticide. Apply these rinsates to a labeled site at or below the label rate. Following these safety practices reduces exposure risks to the applicator and the surrounding environment.

Review Questions

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Write the answers to the following questions, and then check your answers with those in the back of this manual.

1. **Determining *when* to apply a pesticide includes consideration of:**
 - A. The life cycle of the pest and weather conditions.
 - B. The percent active ingredient.
 - C. The need for additives or adjuvants.
 - D. What safety measures you should follow.
2. **The directions for use on a pesticide label indicate:**
 - A. The various crops or areas on which the pesticide may be legally used.
 - B. The disposal of pesticide waste.
 - C. The environmental, physical, and chemical hazards.
 - D. Treatment procedures in case of exposure.
3. **When two or more pesticides mixed together form a putty or paste, separate into layers, or look like cottage cheese, it is an example of:**
 - A. Timing incompatibility.
 - B. Placement incompatibility.
 - C. Chemical incompatibility.
 - D. Physical incompatibility.
4. **What is the usual order for tank mixing pesticides?**
 - A. Fill tank one-fifth to one-half full with carrier, add suspension products, add emulsion products, add solution products, add surfactants (if needed), add compatibility agent (if needed).
 - B. Fill tank one-fifth to one-half full with carrier, add compatibility agent (if needed), add suspension products, add solution products, add surfactants (if needed), add emulsion products.
 - C. Fill tank one-fifth to one-half full with carrier, add surfactants (if needed), add suspension products, add emulsion products, add solution products, add compatibility agent (if needed).
 - D. Fill tank one-fifth to one-half full with carrier, add suspension products, add emulsion products, add solution products, add compatibility agent (if needed), add surfactants (if needed).
5. **Which statement about the proper technique for opening pesticide containers is *true*?**
 - A. You should tear open paper or cardboard containers carefully.
 - B. Put on the appropriate PPE after the containers have been opened.
 - C. Use a sharp knife or scissors to open paper or cardboard containers.
 - D. Leave the container open until you are done mixing pesticides for the day.

6. Which statement about measuring and transferring pesticides is *true*?
- A. When pouring any pesticide from its container, keep the container and pesticide above face level.
 - B. Metal measuring utensils are recommended over plastic.
 - C. Most dusts, powders, and dry formulations are measured by volume.
 - D. After adding the pesticide to the partially filled spray tank, the measuring container should be rinsed and the rinse solution poured into the tank.
7. Which statement about cleaning and disposing of pesticide containers is *true*?
- A. Do not puncture rinsed pesticide containers.
 - B. When rinsing pesticide containers, pour the rinsate down the drain.
 - C. Pesticide containers that cannot be recycled or returned to the manufacturer should be reused.
 - D. Containers must be disposed of in accordance with label directions and federal, state, and local laws and regulations.
8. Which statement about triple-rinsing and pressure-rinsing pesticide containers is *true*?
- A. You must wear protective clothing for triple-rinsing but not for pressure-rinsing.
 - B. Triple-rinsing requires the use of a special nozzle.
 - C. Both triple-rinsed and pressure-rinsed containers are considered non-hazardous waste.
 - D. Triple-rinsing is more effective than pressure-rinsing.
9. Which statement about pesticide rinsates is *true*?
- A. Rinsates may be applied to labeled target sites at or below labeled rates.
 - B. Dispose of rinsates by pouring them down a sink or drain.
 - C. Rinsates containing strong cleaning agents may be reused in pesticide mixtures.
 - D. The amount of pesticide in the rinsate plus the amount of pesticide product in the new mixture may exceed the label rate for the target site.
10. Which statement about pesticide equipment cleanup is *false*?
- A. Several commercial pesticide tank-cleaning compounds are available.
 - B. Sprayers should be thoroughly rinsed with a water-detergent solution for several minutes.
 - C. When getting ready to store your sprayer, add some lightweight oil to the tank before the final flushing.
 - D. Leave pesticide residues in the spray tank when changing products.