



Proper storage of pesticides

By Ajia Paolillo

Editor's note: This article grants one continuing education unit (CEU) in the Core category toward the renewal of a Florida Department of Agriculture and Consumer Services restricted-use pesticide license when the accompanying test is submitted and approved.

Pesticides are widely used in the citrus industry and are important tools in agricultural production. Safety precautions should be taken during all steps of pesticide use, including handling, mixing, loading and application. The label is the law and provides essential safety and product use information that must be followed.

The proper storage of pesticides is equally as important as the application process, to not only protect human health but also to safeguard the environment from soil and water contamination. Depending on your operation and the types and quantities of pesticides used, you will have different storage needs. This article will address the proper storage of pesticides and procedures to avoid health hazards and the contamination of soil and water.

SITE CONSIDERATIONS AND SECURITY

When choosing an appropriate storage facility for your pesticides, consider the site location and size needed for the quantities, formulations and toxicity of the pesticides you use. Some

operations can use a chemical cabinet or small room, while other operations may need an entire building.

Whatever your specific needs are, designate a separate area for pesticide storage. If your storage site is contained within another building, such as a

cabinet or closet area, be sure it is away from employee areas such as break rooms and offices. This minimizes the chances of accidental poisoning from vapors, dust and spills.

Most commercial operations utilize a separate storage building designated for pesticides. This practice is highly recommended. If a separate building is to be designated or constructed, choose a site that is away from wells, ponds, lakes or other areas where ground and surface water could become contaminated. The site should have level firm ground on which to build upon and the ability to install a suitable floor for the structure.

Whatever your storage needs are, the security of the facility is extremely important. The facility you choose for storage should always be kept locked. This will prevent access by unauthorized individuals and intruding vermin, as well as defend against theft.

The use of cameras or alarms can aid in security and deterring unwanted individuals from entering the site. Teach employees to be conscious of and immediately report any suspicious individuals or activities on and around the site.

Warning signs should be posted on the storage area to clearly indicate the presence of pesticides in the building and the potential for flammability. Post "No Smoking" signs on and around the storage site. Proper signs are essential for fire department and emergency personnel, in the case of a spill or fire to identify where the pesticides are stored.

Due to the size of some pesticide containers, such as bulk tanks, outside storage may be necessary. Consider installing a roof or overhang for outside storage, as pesticides can break down in direct sunlight and heat, volatilize and lose their efficacy. It is recommended to place bulk tanks on an impermeable surface that can hold the weight of the container and not allow leaching through the floor of the site. An example would be a sealed concrete slab.

A dike should be constructed around the tank storage area to contain any spills. Be sure to allow room in the containment area for tank valves and pumps. Dikes should be able to contain not only the total amount of liquid in all the tanks, but also at least an additional 10 percent of the total volume, as a precaution. If drains are installed in the diked area, they should be connected to a holding tank in order to contain the spilled chemicals and prevent leakage into the water supply.

Secure fencing should be constructed around all outside storage to keep unauthorized personnel from entering the site and to prevent tampering of the tanks.

TEMPERATURE-CONTROLLED ENVIRONMENT

When storing pesticides, you must keep in mind environmental factors and how they affect the pesticide chemical stability and the durability of the pesticide containers. It is recommended to keep pesticides in a cool, insulated, temperature-controlled environment if possible. Do not store pesticides in direct sunlight.

To find the suitable temperatures for storage, refer to the pesticide label



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for the manufacturer's recommendations. Many pesticides can degrade, reduce efficacy or volatilize when exposed to extreme heat. Heat can also cause pesticide containers to break down, melt, crack or explode, leading to leaks and spills.

Although many months in Florida are spent in the heat, there can be some low temperatures in the winter, which can cause cracking of containers and possible separation of liquid chemical formulations. For example, some liquid fertilizers can "salt-out" in low temperatures, leaving sediment in the bottom of the tank that cannot be easily dissolved back into the solution.

Moisture is another environmental factor in Florida. Moisture can either be from the humidity in the air, rainfall or flooding of the facility. Pesticide containers made from paper and cardboard can swell and fall apart, causing the chemical to seep out. Pesticide formulations such as wettable powders, dusts and granules can clump together and become unusable due to moisture or water damage.

The coating on products such as

slow-release fertilizer reacts with moisture in the field to release the chemical when needed. But, in storage, exposure to moisture can degrade the coating, causing the products to leach out and decrease efficacy.

Some chemicals are stored in metal containers like barrels, which can rust and leak. Water and moisture can also lead to the peeling and degradation of labels on containers, making them illegible and proper chemical identification difficult.

Proper ventilation, such as exhaust fans, aid in temperature control in storage facilities. Having consistent air flow will help keep temperatures from getting too high. Ventilation fans will also allow harmful vapors to escape, along with dust that can accumulate in the storage area. Ventilation fans should direct air to the outside and not another room in the building.

PROPER LIGHTING

Proper lighting is essential in pesticide storage areas. Employees must be able to read the pesticide labels while in the storage area. Spills, leaks and

dust buildup must be visible to anyone entering and working in the storage facility. Proper lighting will allow workers to see potential hazards and aid in safe cleanup.

When installing lighting, it is recommended to use only spark-proof lighting materials as a safety precaution, due to the volatility of some pesticides. As vapors build up, the potential for combustion and fire hazards increases.

PESTICIDES ONLY

The storage area should only contain pesticides. Materials and tools for cleaning up and containing a spill in the facility, such as proper personal protective equipment (PPE), fresh water, soap and paper towels for decontamination should be kept near the storage site. Do not store clean PPE (used for mixing, loading or applying chemicals) with the pesticides. Clean PPE can easily become contaminated by dust or liquids, rendering it unsafe for use.

Never store food, drinks, human or veterinary medicines, or animal feed in the pesticide storage area. This includes

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cold storage, such as a refrigerator or cooler, used for some seeds coated in pesticides. These items can become contaminated through contact from dust and spills, or vapors from pesticides, and cause a health risk.

SHELVES AND FLOORING

Shelves can be utilized in storage areas to keep chemicals organized and off the ground. Use shelving made from nonporous materials such as metal or plastic, as these materials can be cleaned if a spill occurs. Wooden shelves can absorb chemicals and cannot be cleaned thoroughly, leading to contamination.

By utilizing shelf storage, bags and cardboard boxes are less likely to be damaged if the facility floods. Remember to store heavy containers on the bottom of the shelves, to prevent them from becoming top heavy. Another safety precaution is to tether the shelves to the walls to prevent them from falling over. If you have very large, heavy containers, store them on plastic pallets on the floor.

The floor of the storage area should be made of a material that can contain a spill and be properly cleaned. A material such as sealed cement is a good choice. Pesticide storage areas should never have dirt, grass or wood flooring. A chemical spill would most certainly have the potential to leach into the soil and groundwater. It is advisable to create a catch basin in the flooring of your storage area, which would help to contain a spill and aid in cleanup.

PESTICIDE LABELING AND INVENTORY

Pesticides should only be stored in their original containers or a suitable, clearly labeled replacement if the original container is damaged. Never store pesticides in containers that can be used for food or drink, such as old soda or juice bottles, jugs or food jars. The simple misidentification of a pesticide for a food or drink can lead to accidental ingestion, poisoning and even death.

Product labels should always be legible and not damaged. It is a good idea to keep extra copies of pesticide labels on hand and replace damaged labels immediately. If you do not have a spare label, contact the manufacturer for a replacement. In the meantime,

clearly write the pesticide brand name and common name, active ingredient, signal word and EPA registration number on the container.

If you find a damaged container, you have a few options to minimize contamination. First, if possible, you can apply the pesticide in the grove as you would normally, following the recommended label rates. If you cannot apply the pesticide immediately, you must find another suitable container. You can empty the contents into a container of the exact same pesticide that

has a proper label. If this is not available, you can use another container, which can be closed properly.

For example, if you had a damaged bag, you could put the entire bag into a larger plastic bag or container to prevent further damage or spills. Keep the original label clearly visible, so the product is easily identifiable. If the product label is not visible inside the new container, place a replacement label on the outside of the storage container for proper identification.

Just like most products, pesticides



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have a shelf life and should be used before their expiration date. The product label may list an expiration date of the pesticide or you can contact the manufacturer for recommended shelf life information.

When buying product, write the purchase date clearly on the pesticide container. This will aid in keeping track of how old pesticides are, especially if it is a product that is not used very often. It is important to inspect the chemical for signs of degradation prior to application. Depending on the formulation, you may find expired product separating or clumping. Or you may notice loss of efficacy after application.

Organize your products by pesticide type and active ingredient. This will make them easy to locate when needed and provide a visual representation of quantities on hand.

Keep inventory records of your pesticides and what is used in a typical growing season. Only purchase the pesticides you need to use on a yearly or seasonal schedule. It is not recommended to keep a large inventory of pesticides that are not being used.

Containers that are damaged or leaking due to age are a hazard that can be avoided with proper planning and organization. By keeping track of what you actually use, you may save money by keeping only necessary quantities on hand, and not having to dispose of unused expired product.

HAVE SAFETY DOCUMENTS AVAILABLE

The Safety Data Sheets (SDS) of all the pesticides used in your operation should always be kept on file and be easily accessible by personnel. The SDS contain important information on chemical properties, flammability, fire control and first aid procedures. In the case of a spill, proper PPE and clean-up materials should be used. This information will also be listed in the SDS.

OTHER SAFETY CONSIDERATIONS

Another safety measure to consider is having materials used for decontamination near the storage area. Having an eye wash station and outside shower installed will allow personnel to quickly wash off pesticides that contaminate their eyes, skin or clothing.

Keep materials (such as clay, pet litter and absorbent pads) suitable for cleaning up spills easily accessible. Be sure to clearly label all utensils (spoons, cups, etc.) used in measuring or mixing pesticides. Keep them in a specific area, so they are not used for any other purpose. Educate personnel about the importance of the safety measures used in pesticide storage.

SUMMARY

By implementing the discussed practices and safety measures for your pesticide storage needs, human health hazards and environmental contamination can be minimized. It is important to evaluate and inspect your pesticide storage facility on a routine basis.

Ensure the security measures in place are maintained and working properly. Check that warning signs are clearly visible and posted on and around the site. Inspect the flooring for cracks that could cause soil and water contamination. Examine pesticide containers for signs of damage and leaks. Replace damaged pesticide labels or clearly write the chemical information on the container. Also, remember to clean the storage facility regularly to avoid a buildup of dust and dirt. Always clean up any spills or leaks immediately, using proper PPE and equipment.

Source: Applying Pesticides Correctly (7th Edition) by F.M. Fishel, 2014, University of Florida Institute of Food and Agricultural Sciences (UF/IFAS).

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If you have questions regarding this form, test or CEUs, email Ajia Paolillo at ajiacunningham@ufl.edu or call 863-993-4846. Please allow two weeks to process your CEU request.

CEU test: 'Proper storage of pesticides'

To receive one Core continuing education unit (CEU), read "Proper storage of pesticides" in this issue of Citrus Industry magazine. Answer the 20 questions on the magazine's website (www.CitrusIndustry.net) or mail the answers and application information to the address at the end of the article. You must answer 70 percent of the questions correctly to receive one Core CEU. The article and test set are valid for up to one year from the publication date. After one year, this test will no longer grant a CEU.

1. When choosing an appropriate site for pesticide storage, which of the following is true?
 - a) It does not need to be locked and secure.
 - b) The closet in the employee break room is a safe pesticide storage site.
 - c) The site should be located away from wells, lakes, ponds and other water sources.
 - d) The facility does not need flooring installed if the dirt is packed down hard.
2. Which environmental factors can negatively affect pesticides and their storage containers?
 - a) Moisture and water
 - b) Hot and cold temperatures
 - c) Direct sunlight
 - d) All of the above
3. When should you replace a damaged pesticide label?
 - a) Immediately
 - b) Replacing a damaged label is not necessary.
 - c) When you can get around to it
 - d) None of the above
4. Which practice is recommended for a pesticide storage facility?
 - a) Provide proper lighting.
 - b) Ensure proper labeling of all pesticides.
 - c) Secure the facility with locks and other security measures.
 - d) All of the above
5. Ventilation fans should always direct air to the outside and not to another room in the building.
 - a) True
 - b) False
6. When constructing a dike around outside pesticide storage tanks, how much volume should the diked area be able to contain?
 - a) The total amount of liquid in the tanks
 - b) The total amount of liquid in the tanks, plus at least 10 percent of that volume
 - c) Half the amount of liquid in the tanks
 - d) None, if you have a drain installed
7. Where can you find information about the shelf life of a pesticide?
 - a) The pesticide label or by contacting the manufacturer
 - b) The pesticide purchase invoice
 - c) Nowhere, pesticides do not expire
 - d) None of the above
8. Pesticide containers should be inspected regularly for damage and leaks.
 - a) True
 - b) False
9. What information should you put on a pesticide container when the label is missing?
 - a) Brand name and common name
 - b) Signal word
 - c) EPA registration number
 - d) All of the above
10. Very large, heavy pesticide containers should be stored on _____.
 - a) Wood pallets
 - b) Plastic pallets
 - c) The bare floor
 - d) None of the above

Test continues on page 30.

11. An old drink bottle should never be used as a storage container for pesticides.
 - a) True
 - b) False
12. Ventilation fans aid in temperature control and help to remove _____ and _____ from inside the storage facility.
 - a) Seeds and plant material
 - b) Insects and pests
 - c) Vapors and dust
 - d) None of the above
13. It is a recommended practice to keep a current inventory of your pesticides.
 - a) True
 - b) False
14. Nonporous materials such as plastic and metal are suitable for shelving in the storage area because they can be cleaned after contamination from a spill or leak.
 - a) True
 - b) False
15. Always store _____ pesticide containers on the bottom shelves to prevent them from falling over.
 - a) Heavier
 - b) Lighter
 - c) Cardboard
 - d) Bagged
16. It is safe to keep clean personal protective equipment that is used for pesticide mixing, loading and application in the storage area.
 - a) True
 - b) False
17. Pesticide labels should always be visible and legible.
 - a) True
 - b) False
18. Which items are good to have near the pesticide storage area for decontamination?
 - a) Eye wash station
 - b) Outdoor shower
 - c) Clean water, soap and paper towels
 - d) All of the above
19. Warning signs which indicate "Pesticide Storage" and "No Smoking" should be clearly posted on and around the storage site.
 - a) True
 - b) False
20. All food, drinks, and human or veterinary medicine should be kept out of the pesticide storage area to avoid contamination and accidental ingestion.
 - a) True
 - b) False

Please circle the number below to rate this article and test:

Not very useful	1	2	3	4	5	6	7	8	9	10	Very useful
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Pesticide Applicator CEU Form

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E-mail: _____ Phone: _____

Pesticide License Number: _____

Address: _____

City: _____ State: _____ Zip: _____