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Pesticide Storage, Mixing, and Disposal on the Farm

Pesticides have played an important role in creating and sustaining the agricultural revolution. Because of their toxic nature, however, pesticides pose a risk to humans, animals, and the environment when they are not handled properly. Absence of safety precautions can result in accidents, affecting the producer, the employees, their families, and farm animals, sometimes with serious consequences. Nationwide, approximately 75% of all accidents involve nonusers, who may be unaware of the potential dangers posed by pesticides. Further, improper handling of pesticides can pose dangers to the farm and community in ways that are not immediately apparent. Spillage can result in a portion of the pesticide leaching into the ground and contaminating the groundwater or reaching the streams. Pesticide contamination of streams could adversely impact the health of animals and other stream users, including aquatic life. Large amounts of pesticide in drinking water could cause chemical burns, nausea, and convulsions. However, even very small pesticide concentrations, while not apparent without testing in the laboratory, could have serious long-term health effects.

Not only can improper pesticide handling cause adverse health effects, it also can result in violation of state and federal regulations, leading to penalties. In this publication, guidelines are provided for the safe storage, mixing, and disposal of pesticides; steps to take in case of a spill are also given. These guidelines are based on the works of many experts in the area of pesticide handling. However, these suggestions do not supersede use instructions provided by the manufacturer or state and federal regulations.

Safe pesticide handling begins with reading the label, which is also required by law.

Storage

For storing very small quantities of pesticide, a metal storage cabinet may be adequate. However, a separate room (or building, for large quantities) is desirable for storing larger amounts of pesticide, as on a farm. There are no state or federal regulations regarding pesticide storage on the farm or at home. However, pesticide labels may carry storage recommendations or requirements. In addition to such recommendations or regulations, the following guidelines should be followed for storing pesticides on the farm and at home. While the storage guidelines given below are intended for room and building storage, some guidelines also apply to cabinets used for storing pesticides.

- Where feasible, the facility should be located downwind and downhill from homes, play areas, animal structures, feedlots, and wells.
- The structure should not be located in an area prone to flooding.
- The storage facility should be posted with a weather-proof sign saying **"DANGER - PESTICIDES KEEP OUT"** or something similar.
- Only a few responsible and well-informed people (2-3) should have access to this facility. Children and pets should not be allowed into the facility.
- A current inventory of all pesticides, along with copies of their labels, should be maintained at a separate location. The information should include trade or product

names, active ingredients, amounts, and expiration dates. Pesticides label copies are available in the Greenbook (Crop Production Reference), and online at www.greenbook.net.

- A Material Safety Data Sheet (MSDS) for each pesticide in storage should be obtained from the distributor or from the Greenbook and filed with the pesticide inventory. All pesticide users should be aware of the type of information in the MSDS. In an emergency, the MSDS information will be useful to emergency personnel. The MSDS describes procedures to contain and manage spills.
- Since the MSDS also lists first aid measures, a copy of the relevant portion of the MSDS for all pesticides in storage should be kept in the first aid kit (discussed later).
- The storage facility should be secured against fire hazards. One or more ABC-type (all-purpose) fire extinguishers should be kept in visible locations. Fire detectors are recommended for larger facilities.
- The storage facility should be cross-ventilated, preferably with an exhaust fan for proper venting. Temperatures should be kept between 32 and 100 degrees Fahrenheit. If there is a separate weighing room, it should be well-ventilated.
- Sealed concrete floor (with no floor drain) and concrete block walls are recommended.
- Pesticides should be stored on steel shelves (instead of wooden shelves), preferably with lips to prevent containers from rolling off the shelf. Dry formulations should be stored on the upper shelves and the liquid formulations stored on the lower shelves. Large drums or bags should be kept on pallets painted with chemically resistant epoxy paint.
- No other material such as food, feed, seed, fertilizer (except pesticide-fertilizer combinations), or flammable material should be stored in the same cabinet or room.
- Pesticides should be stored in their original containers only (it's the law). Further, precautions should be taken to protect the labels to prevent confusion later. Wide transparent tapes could be used to protect the labels
- Pesticide containers should be periodically examined for leakage, corrosion, and loose caps. A pesticide in a damaged container should be transferred to an empty container that held exactly the same pesticide along with a copy of the label from the damaged container. Hence, it would be advisable to retain a clean empty container.
- Cross-contamination of pesticides should be avoided by storing different pesticides (e.g., herbicides, fungicides) on different shelves. Volatile pesticides should be stored in air-tight containers separate from other easily contaminated pesticides.
- The storage area should be large enough to store used containers and material to handle spills. While personal protective gear should be stored in the same facility, such gear should not be stored in the same room with pesticides to avoid contamination. Activated charcoal, Vermiculite, clay-granule cat litter, and sawdust are effective in absorbing pesticide spills. Hydrated lime, laundry bleach, and strong detergents to neutralize spill patches also should be stocked.
- A mixing/loading area is required adjacent to the storage facility (discussed below).

Mixing

A properly designed mixing/loading system is essential for proper pesticide handling. If more than 300 gallons of liquid pesticide (concentrated or diluted) or 3,000 pounds of net dry pesticide are handled in 30 days (consecutive or cumulative) in a year, West Virginia state law (Title 61 Legislative Rule Department of Agriculture Series 12I) requires a "permanent operational area" for handling the pesticides. For operations that handle smaller amounts of pesticide, an "operational area" may be designated during the time of pesticide handling. The following guidelines are provided for setting up a pesticide mixing/loading system.

- Plans for a suitable mixing/loading area may be obtained from the book "Designing Facilities for Pesticide and Fertilizer Containment" published by the MidWest Plan Service or by contacting county Extension agents.
- The mixing pad should be large enough to accommodate the spraying equipment used, leaks from bulk tanks, wash water from cleaning equipment, and spills from transferring chemicals to the sprayer.
- For a "permanent operational area," state law requires a concrete mixing pad. A mixing pad should have curbs on all sides to confine contaminated runoff to the pad. The pad should have a minimum capacity of 250

gallons or 10% of the volume of the largest application equipment, if the application equipment storage capacity is larger than 2,500 gallons. The mixing pad should drain into a covered sump; sump capacities may range from 15 to 50 gallons, depending on the size of operation. The mixing pad should be covered to minimize the amount of pesticide-contaminated rainwater collecting in the sump.

- For a smaller operation where a "permanent operational area" is not required, an earthen mixing pad may be used; however, a concrete mixing pad is preferred. In the case of a packed earthen mixing pad, the surface should not allow rapid infiltration of the pesticide into the soil. Hence, gravel and sandy surfaces are unsuitable for use as "operational areas." Further, the same location should not be used repeatedly for mixing. Mixing/loading sites should be located at least 100 feet away from wellheads, streams, or sinkholes or as specified in the MSDS or label by the pesticide manufacturer.
- The mixing pad should have water supply not only for mixing, loading, rinsing, and cleaning but also for showers and cleanup for the pesticide handling crew in case of an emergency. An eyewash is also required in addition to a shower stall and sink. Towels, soap, and a change of clothes should be available for decontamination.
- A first aid kit and fire extinguisher are required for the mixing pad. A pesticide first aid kit should have the following items:
  - 1-ounce bottle of ipecac to induce vomiting **(Note: Never induce vomiting unless the MSDS first aid section, EMS dispatcher, or poison control center recommends it)**;
  - pint bag of activated charcoal to be mixed with water and swallowed (activated charcoal absorbs many pesticides);
  - can of evaporated milk to help dilute poison and can opener;
  - blanket for treating shock;
  - plastic or waterproof tape or bandages to cover cuts and scrapes to prevent pesticide contamination;
  - two 1-quart containers of clean water if the water supply is unavailable at the mixing pad
  - plastic containers with tight-fitting lids for use in drinking, mixing, and collecting vomit samples; and
  - teaspoons and disposable rubber gloves.
- There should be a phone connection nearby in case of emergency. Emergency telephone numbers (poison center and fire department) should be displayed in a prominent location. In case of an emergency, the 24-hour toll-free number provided in the MSDS for the pesticide is also useful.
- The pesticide label should be checked to see what kind of personal protective equipment is required for a particular pesticide. The degree of protection required depends on the toxicity of the chemical. Given below are the minimum accessories required for each category of pesticide (as identified on the label).
  - ❖ Category 3 (CAUTION): Long-sleeve shirt and pants, socks, shoes, and chemical-resistant gloves
  - ❖ Category 2 (WARNING): Long-sleeve shirt and pants, socks, shoes, coveralls, protective eyewear, chemical-resistant gloves, chemical-resistant footwear, and respirator
  - ❖ Category 1 (DANGER or DANGER-POISON): Long-sleeve shirt and pants, socks, shoes, chemical-resistant coveralls, protective eyewear, chemical-resistant gloves, chemical-resistant footwear, and respirator
- The pesticide should be mixed with the wind to the back in a well-lighted and ventilated space.
- Two pesticides should not be mixed unless mentioned on the label.
- Concentrated pesticide should be mixed and poured, preferably below waist level and never at eye level.
- Pesticide should always be poured and mixed in a pail before pouring it into the container.
- The pesticide should be poured into the water. However, when water is poured into a container containing pesticide, care should be taken to keep the water hose at least 6 inches above the liquid surface to ensure that backsiphon does not occur if the pump fails. An antibacksiphon device will further minimize the possibility of backsiphon. Local regulations should be checked to see if antibacksiphon devices are required.
- In the field, mixing and loading at the same site repeatedly should be avoided. Further, a minimum distance of 100 feet should be maintained with respect to streams and sinkholes or as specified on the label.

Disposal

In addition to empty containers, excess pesticide mixture and rinsate at the end of application, as well as unused pesticides, need to be disposed of safely. Specific guidelines are provided below.

Empty containers

If not properly cleaned, empty containers may still contain pesticide residues. Such containers can pose health hazards in the hands of children or if used for other purposes. Most important, label instruction should be followed for the proper disposal of the container. In general, the following suggestions are provided for handling empty containers.

- Containers should be triple-rinsed or jet-rinsed, and the resulting rinsate should be added into the spray mixture for field application. The rinsed containers should be packed with absorbent clay or newspaper, wrapped in a newspaper, and disposed of as special waste in consultation with West Virginia Department of Agriculture's Pesticide Regulatory Program (304-558-2209). By West Virginia law, paper boxes or containers can be disposed of in landfills as solid waste, but plastic or metal pesticide containers cannot be sent to landfills.
- Large containers (30- or 55-gallon drums) should be triple-rinsed or jet-rinsed and kept in secure storage before being returned to the manufacturer, or the Pesticide Regulatory Program (304-558-2209) should be contacted for advice. Such containers should not be used for other purposes.

Excess pesticide mixture

At the end of the application, there may be some extra pesticide mixture left after the application as well as rinsate obtained after rinsing the sprayer equipment and mixing pad (that collected in the sump). Even though the rinsate is likely to be very dilute, its improper disposal can cause health hazards. The following guidelines should be used to dispose of excess pesticide mixture and rinsate.

- The excess mixture should not be applied to the area sprayed earlier since pesticide toxicity and higher pesticide residue in the harvested produce could result.
- The excess mixture should not be dumped into the drain or in streams since that can cause negative environmental impacts.
- The excess mixture should be applied to another field, lawn, or garden where the pesticide can be applied and which is in need of the pesticide. Or, the excess mixture may be stored for future use; however, care should be taken to apply it as soon as possible.
- The rinsate should not be dumped into the drain or stream. It could be stored for use as makeup water for subsequent application; however, it must be used as soon as possible.
- The rinsate could also be applied to croplands or turf that are approved for that pesticide, provided it does not result in overapplication.
- Rinsates of different pesticides should not be mixed.

Unused pesticides

To minimize the problem of accumulating unused pesticides, only pesticides required in the short term should be purchased. Even with precautions, it is likely that there will be some pesticide remaining for which there is no use. Disposing of old, outdated, and banned pesticides is complicated. The following guidelines are provided for disposing of such pesticides.

- The pesticide retailer or manufacturer should be contacted to find out if that pesticide can still be legally applied as in the case of discontinued products. If the pesticide is banned, outdated, or deteriorated, help of the retailer or manufacturer should be sought to dispose of the product. Retailers and manufacturers may have programs for recycling or disposing off such products.
- If the pesticide is legal and not outdated, and if its container is in good condition, the retailer could accept it and give a refund. Otherwise, neighbors or friends should be contacted to see if they have any use for it.
- Another alternative for disposing of pesticides, both legal and banned, is to contact hazardous waste recyclers.
- Excess pesticides should **never** be:
  - Burned
  - Buried
  - Disposed of in garbage
  - Dumped in the drain

Spillage

It is important to be aware of the toxic risks posed by the pesticides. Such information, along with steps to be taken in case of a spill, is provided in the MSDS for that pesticide. The MSDS also provides 24-hour toll-free number to call for advice. The following practices are required for all spills. However, guidelines provided in the MSDS as well as state and federal regulations supersede the guidelines given below.

- People and animals should be kept away from the spill site.
- Employees should be equipped with protective gear.
- Spilled liquid material should be absorbed with activated charcoal, Vermiculite, catlitter, or sawdust. If necessary, a soil dike should be built to prevent runoff and further contamination. Contaminated soil and absorbent material should be shoveled into, and stored in leak-proof drums. Spillage should never be hosed down as it will cause the pesticide to infiltrate into the soil.
- The MSDS label of the pesticide should be consulted to select a suitable neutralizing agent such as hydrated lime, laundry bleach, or strong detergent. The contaminated area should be neutralized by thoroughly scrubbing with neutralizing agent.
- If possible, the contaminated absorbent and soil should be spread over a labeled site or crop, at or below the recommended application rate. Otherwise, the contaminated absorbent or soil should be disposed of as pesticide.
- Report pesticide spills to the Pesticide Regulatory Program (304-558-2209) of the West Virginia Department of Agriculture

Suggested reading

There are many other documents, particularly on the Internet, that provide information on various aspects of pesticide use. The following titles are suggested to supplement material contained in this bulletin.

- "Pesticide storage, handling, and management" published by Virginia Cooperative Extension in 1996. (http://www.ext.vt.edu/pubs/farmasyst/442-907/442-907.html)
- "Agricultural pesticide safety" published by the University of Florida in 1992. (http://www.cdc.gov/niosh/nasd/docs/as11000.html)
- "Protecting groundwater from pesticide contamination" published by Washington State University in 1991. (http://coopext.cahe.wsu.edu/infopub/eb1644/eb1644.html)
- "Safe storage and disposal of pesticides and farm chemicals" published by Montana State University Extension Service in 1990. (http://www.cdc.gov/niosh/nasd/docs2/as25300.html)
- "Farm pesticide storage" published by the University of Nebraska in 1979. (http://www.ianr.unl.edu/pubs/Pesticides/g460.htm)

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