Proper Pesticide Storage

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Outline

• Pesticide storage:
  – Active ingredient stability (shelf life)
    • EPA storage testing guidelines – how are label statements derived?
  – Common sense (Examples)
General Storage Statements on Labels

“Do not contaminate water, food, or feed by storage, disposal, or cleaning of equipment. Open dumping is prohibited.”

“Store in original containers only.”

“Store in a dry place.”

“Do not store or transport near feed or food.”

STORAGE AND DISPOSAL

PROHIBITIONS: Do not contaminate water, food or feed by storage, disposal, or cleaning of equipment. Open dumping is prohibited.

STORAGE: Store in a cool dry place. Keep pesticide in original container. Do not put concentrate or dilute into food or drink containers. Not for use or storage in or around the home. Do not store diluted spray. For help with any spill, leak, fire, or exposure involving this material, call day or night 1-800-424-9300.

PESTICIDE DISPOSAL: This product is acutely hazardous. 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: Nonrefillable container. Do not reuse or refill this container. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container ¼ full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incineration or, if allowed by State and local authorities, by burning. If burned, stay out of smoke.
As a general rule of thumb, two years is considered the maximum storage life for most pesticides, although there are many exceptions.
<table>
<thead>
<tr>
<th>AI</th>
<th>Trade name™</th>
<th>Storage statement(s) regarding temperature/moisture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluridone</td>
<td>Avast!</td>
<td>None</td>
</tr>
<tr>
<td>Imazamox</td>
<td>Clearcast 2.7G</td>
<td>Store in a dry place</td>
</tr>
<tr>
<td>Flumioxazin</td>
<td>Clipper</td>
<td></td>
</tr>
<tr>
<td>Bispyribac</td>
<td>Tradewind</td>
<td>Store in a cool, dry place</td>
</tr>
<tr>
<td>Copper carbonate</td>
<td>Captain</td>
<td></td>
</tr>
<tr>
<td>Penoxsulam</td>
<td>Galleon</td>
<td></td>
</tr>
<tr>
<td>Copper sulfate</td>
<td>SeClear</td>
<td>Keep from freezing</td>
</tr>
<tr>
<td>Glyphosate</td>
<td>AquaPro</td>
<td>Store above 10°F to keep product from crystallizing</td>
</tr>
<tr>
<td>Imazapyr</td>
<td>Habitat</td>
<td>Do not store below 10°F</td>
</tr>
<tr>
<td>Triclopyr</td>
<td>Renovate</td>
<td>Store above 28°F</td>
</tr>
<tr>
<td>Diquat</td>
<td>Reward</td>
<td></td>
</tr>
<tr>
<td>2,4-D</td>
<td>Weedar</td>
<td>Store at temperature above 32°F</td>
</tr>
<tr>
<td>Aquathol K</td>
<td>Endothall</td>
<td>Storage at temperatures below 32°F may result in the product freezing or crystallizing</td>
</tr>
</tbody>
</table>
EPA Storage Testing Guidelines

Storage testing is a requirement of FIFRA.

**PHYSICAL OR CHEMICAL HAZARDS**
Spray solutions of this product should be mixed, stored and applied using only stainless steel, aluminum, fiberglass, plastic or plastic-lined steel containers.

Do not mix, store or apply this product or spray solutions of this product in galvanized steel or unlined steel (except stainless steel) containers or spray tanks. This product or spray solutions of this product react with such containers and tanks to produce hydrogen gas, which may form a highly combustible gas mixture. This gas mixture could flash or explode, causing serious personal injury, if ignited by open flame, spark, welder’s torch, lighted cigarette or other ignition source.

**STORAGE AND DISPOSAL**
Do not contaminate water, food, or feed by storage or disposal. Storage: Store in cool place. Store product away from other pesticides, food, and feed. In case of leakage or spill, soak up with sand or another absorbent material. Pesticide Disposal: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility. Container Disposal: Nonrefillable container. Do not reuse or refill this container. Clean container promptly after emptying. Triple rinse as follows. Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container ¼ full with water and recap. Shake for 10 seconds. Pour rinseate into application equipment or a mix tank or store rinseate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then offer for recycling if available, or puncture and dispose of in a sanitary landfill, or by incineration, or if allowed by state and local authorities, by burning. If burned, stay out of smoke.
EPA Storage Testing Guidelines

• The test should be conducted with the product in its commercial package or in smaller packages of the same construction and materials

• The concentration of the ai is determined:
  – at the beginning of the test period
  – after 3 months
  – after 6 months
  – at the end of the test period (1 year)\(^1\)
    • \(^1\)may test longer at the registrant’s discretion with EPA guidance
At the end of the test, the product is examined for physical changes, such as phase separation or clumping.
EPA Storage Testing Conditions

• If the package is permeable:
  – 68°F or 77°F at 50% RH

• If stored under warehouse conditions (expanded):
  – Heat: 104°F to 129°F
  – Cold: -4°F to 32°F
Pesticide Stability while Diluted

Spray tank construction

Diluent pH

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Pesticide Stability while Diluted

Flumioxazin:

Clipper Herbicide is fast acting, and can be applied subsurface to control submersed and floating aquatic weeds. Clipper Herbicide can also control floating and emergent weeds growing on or above the water surface when the product is applied to the foliage of those plants. It is most effective when applied to young, actively growing weeds in water with a pH of less than 8.5. Clipper Herbicide breaks down rapidly and loses herbicidal effectiveness in high pH water (pH greater than 8.5).

Some pesticides undergo a reaction in water with a high pH known as alkaline hydrolysis.
APPLICATION AND SPRAYER INFORMATION

Mixing Instructions
• Mix with water having pH of 5 to 7. If pH is higher than 7, use an appropriate buffer to reduce pH to desirable range.
What is pH?

- Indicator of alkalinity or acidity
- Scale from 1.0 to 14.0
- Logarithmic concentration scale of:
  - $H^+$ (Hydrogen) and $OH^-$ (Hydroxide) ($H^+ + OH^- = H_2O$)
  - If $H^+ = OH^- : \text{then pH is 7.0 or neutral}$
  - If $H^+ > OH^- : \text{then pH is acidic}$
  - If $H^+ < OH^- : \text{then pH is alkaline (basic)}$
pH Scale

- Scale is logarithmic; so:
  - pH 5.0 is 10x more acidic than pH 6.0
  - pH 4.0 is 100x more acidic than pH 6.0
Why is pH important to applicators?

- Some pesticides lose effectiveness when mixed with alkaline water.
- pH of 8 to 9 can greatly diminish or cause complete loss of effectiveness.
- Most common with some insecticides: carbamates and organophosphates.
- Few fungicides and herbicides susceptible.
Why is pH important to applicators?

- Most water sources in FL derive from limestone aquifers.
- Contain high levels of carbonates – removes H+ from water, thus increases pH.
## Examples (pH half-lives)

<table>
<thead>
<tr>
<th>Pesticide</th>
<th>pH 6</th>
<th>pH 7</th>
<th>pH 8</th>
<th>pH 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>carbaryl</td>
<td>125 days</td>
<td>27 days</td>
<td>2-3 days</td>
<td>1-3 days</td>
</tr>
<tr>
<td>dimethoate</td>
<td>12 h</td>
<td>---</td>
<td>---</td>
<td>1 h</td>
</tr>
<tr>
<td>disulfoton</td>
<td>32 h</td>
<td>---</td>
<td>---</td>
<td>7 h</td>
</tr>
<tr>
<td>malathion</td>
<td>8 days</td>
<td>3 days</td>
<td>19 h</td>
<td>---</td>
</tr>
<tr>
<td>Flumioxazin</td>
<td>---</td>
<td>24 h</td>
<td>---</td>
<td>15 min</td>
</tr>
</tbody>
</table>
Determining pH

http://soilslab.ifas.ufl.edu
Is this your storage facility?
How about this one?
How about this one?
So, what does a good storage facility supposed to have and look like?
Let’s go in and take a look.

How do I know what to look for???
III. PESTICIDE STORAGE

1. Are RUP’s stored in a secure manner? □ Yes □ No □ N/A

2. Are pesticides stored according to label directions? □ Yes □ No □ N/A

3. Condition of storage area appears not to injure or endanger water/humans/wildlife/livestock/crops? □ Yes □ No □ N/A

Comments:

II. HISTORY OF BUSINESS

Corporate/Company Officers Title and Responsibility

Name and Address of Related Firms: ____________________________________________

Persons Interviewed

Title

Number of Licensed Applicators at Firm:

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Comments:

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The product label is the final word!

STORAGE AND DISPOSAL

STORAGE: Always store pesticides in a secured warehouse or storage building. Store at temperatures above 32°F. If allowed to freeze, rework to 40°F; remix thoroughly before using. This does not alter the product. Containers should be opened in well-ventilated areas. Keep container tightly sealed when not in use. Do not stack cardboard cases more than two pallets high. Do not store near open containers of fertilizer, seed or other pesticides. Do not contaminate water, food or feed by storage or disposal.

PESTICIDE DISPOSAL: Pesticide wastes are toxic. If container is damaged or if pesticide has leaked, contain all spillage. Absorb and clean up all spilled material with granules or sand. Place in a closed, labeled container for proper disposal. Improper disposal of excess pesticide, spray mixtures, or rinsate is a violation of Federal law and may contaminate ground water. 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: Triple rinse (or equivalent), adding rinsate to spray tank. Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by State and local authorities. Plastic containers are also disposable by incineration, or if allowed by State and local authorities, by burning. If burned, stay out of smoke.
Make a Checklist

- 4 major categories:
  - General information
  - Pesticide containers
  - Spills and disposal
  - Safety information
1. General Information

- Clean, neat storage site
- Current, on-site inventory list
- Posted emergency phone numbers
- Labels/MSDSs on file
- Accurate storage inspection log kept
What’s wrong here?
Clean, Neat Site
Posted Emergency Phone Numbers

Emergencies that deal with Facilities/Maintenance
Roxy Hoover (863) 956-1462
Dan Tuzzolo (863) 984-9349
Wayne Tyler (863) 299-8644 or (863) 258-6417
Bruce Robertson (863) 299-2738 or (863) 289-0768
Kevin Troelsen (863) 956-5654
Diamond Banaw (863) 956-5592
Mike Daugherty (863) 294-3905 or (863) 604-2071

Hazardous Waste Spills
Dan Tuzzolo (863) 984-9349

Security Mishaps/Accidents, Fights, Thefts
Dan Tuzzolo (863) 984-9349
Lake Alfred Police Dept 911

Emergencies
Fire 911
Lake Alfred Police Dept 911

Spill Emergency Phone Numbers
Medical Emergency 911
Police 911 (863) 291-5200
Ambulance 911
Fire Department 911 (863) 291-5202
Winter Haven Hospital (First Care) (863) 291-6050
Poison Control Center 1-800-345-6789
Polk County Emergency Management Ctr (863) 534-0360
National Response Center 1-800-424-8802
2. Pesticide Containers

- Containers marked with purchase date
- Herbicides kept separately
- Stored in original containers
- Labels attached/legible
- Caps tightly closed

- Pesticides stored off floor
- Dry formulations on pallets
- Used containers rinsed and punctured
- Rinsed and unrinsed containers separated
Containers Marked with Purchase Date
What’s wrong here?

Store in Original Containers!
Could this happen to you?
What’s wrong here?

Keep labels attached and legible!
What do you do if the label comes off and is lost?

• Mark the container with basic information
  – Trade name
  – Common name
  – EPA registration number
  – Amount of active ingredient(s)
  – Signal word
  – Use classification
  – Manufacturer

• Then request a replacement from the dealer
Keep pesticides stored up off floor!
What’s wrong here?

Hurricane Wilma Victim

Keep dry formulations on pallets!
What’s wrong here?
Used containers rinsed and punctured!
3. Spills and Disposal

- Storage area free of spills and leaks
- Spill kit available
- Floor drains sealed (if present)
What’s wrong here?

Storage area free of spills and leaks!
Keep a spill kit available!
### Spill Kit Contents

- Chemical-resistant gloves
- Chemical-resistant coverall
- Chemical-resistant boots
- Chemical splash goggles
- Respirator
- Temporary hazardous material storage bag
- Absorbent pad for water- or solvent-based chemicals
- Absorbent tube sock (containment snake)
- Bentonite/polymer mix paste for plugging leaking containers
- Floor absorbent granules
- Shovel or broom
- Dust pan
- Warning sign
Cleaning up the Spill

• The 3 C’s of spills:
  – Control
  – Contain
  – Cleanup
4. Safety Information

- No smoking signs posted
- No food, feed, or fertilizers
- Safety equipment separated from pesticides
- Fire extinguisher (and it works)
- Storage room/building locked
- Room/building posted: Pesticides – Keep Out
- Site well lit and ventilated
What’s wrong here?

No food in the storage area!
What’s wrong here?

Safety equipment separated from pesticides!
Site Security

- Theft reports during the past year: Lee, Palm Beach, Martin, Hendry, and Manatee Counties
- All involved farm chemicals
- All occurred after the facilities were closed
Site Security Recommendations

- Secure buildings, vehicles, and equipment
- Secure computer system access: authorized personnel only
- Develop procedures and policies supporting security
- Inventory management policies: limit the amount
- Establish a procedure for locking up at closing
- Effective hiring practices
Fire Extinguisher

• How long has it been sitting there?
• Is the extinguisher inspected monthly?
• Has it been professionally evaluated this year?
• Are you and your employees trained to use it?
Vehicles and Pesticide Storage
What’s wrong here?

Don’t store pesticides in vehicle interiors!
Are these pesticides really secure?

Keep pesticides in vehicle lock boxes!
What’s wrong here?

Keep a spill kit in the vehicle!
Available from IFAS Bookstore
Thanks for your attention!