Small sprayer calibration and Safe pesticide storage
SMALL SPRAYER CALIBRATION
Calibration process

• Add water to clean sprayer
Calibration process

- Measure out test area [18.5’ x 18.5’]
Calibration process

- Spray the test area with water
Calibration process

• Add water to clean sprayer
Calibration process

- Spray in bucket average time needed to spray test area
Calibration process

- Measure number of ounces collected
Calibration process

• Number of ounces collected = number of gallons per acre the sprayer is delivering
Calibration process

• Determine the volume of spray tank
Calibration process

- Find amount of liquid herbicide needed to add to 1 gallon of water from table...

<table>
<thead>
<tr>
<th>Volume [Gals/acre]</th>
<th>Recommended herbicide rate per acre (Imperial system)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 pint</td>
</tr>
<tr>
<td>20</td>
<td>5 tsp</td>
</tr>
<tr>
<td>30</td>
<td>3 tsp</td>
</tr>
<tr>
<td>40</td>
<td>2.33 tsp</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Volume [Gals/acre]</th>
<th>Recommended herbicide rate per acre (Metric system)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 pint</td>
</tr>
<tr>
<td>20</td>
<td>24 ml</td>
</tr>
<tr>
<td>30</td>
<td>15 ml</td>
</tr>
<tr>
<td>40</td>
<td>11.5 ml</td>
</tr>
</tbody>
</table>
COSTS ASSOCIATED WITH MISAPPLICATIONS
Money wasted...

- A system that is not properly calibrated will result in extra “production” costs
- Equipment should be less than 5% over- or under-application, as recommended by USDA and EPA
Field checks of spraying operations

• Many operators can’t predict actual product applied by their equipment except by dependence on a controller or trial-and-error.
Field checks of spraying operations

• Many operators can’t predict actual product applied by their equipment except by dependence on a controller or trial-n-error

• NE: 130/152 applicators calibrating/mixing errors
Field checks of spraying operations

• Many operators can’t predict actual product applied by their equipment except by dependence on a controller or trial-n-error

• NE: 130/152 applicators calibrating/mixing errors

• ND: 60% sprayers with >10% calibration errors
Field checks of spraying operations – 2

• Drive-in clinics in IA/OH showed only 22% sprayers applying correctly. Calibration errors ranged from 75% under to 50% over application.
Field checks of spraying operations – 2

• Drive-in clinics in IA/OH showed only 22% sprayers applying correctly. Calibration errors ranged from 75% under to 50% over application.

• NE: two-thirds of applicators were spraying with error rate >10%
Costs of over-spraying

- More money spent than needed
# Pre-emergent herbicides

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Product cost</th>
<th>High rate per acre</th>
<th>Cost per treated acre</th>
<th>Cost /acre 15% over-application</th>
<th>Cost for 25 acres 15% over-application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Princep (simazine)</td>
<td>$5/#</td>
<td>4.4 #</td>
<td>$22</td>
<td>$3.30</td>
<td>$82.50</td>
</tr>
<tr>
<td>Pendulum (pendimethalin)</td>
<td>$70/gal</td>
<td>4.2 qts</td>
<td>$73.50</td>
<td>$11</td>
<td>$275</td>
</tr>
<tr>
<td>Surflan (oryzalin)</td>
<td>$80/gal</td>
<td>4 qts</td>
<td>$80</td>
<td>$12</td>
<td>$300</td>
</tr>
<tr>
<td>Oust (sulfometuron)</td>
<td>$96/#</td>
<td>1 oz</td>
<td>$6</td>
<td>$0.90</td>
<td>$27.50</td>
</tr>
</tbody>
</table>
## Post-emergent herbicides

<table>
<thead>
<tr>
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<th>Product cost</th>
<th>High rate per acre</th>
<th>Cost per treated acre</th>
<th>Cost /acre 15% over-application</th>
<th>Cost for 25 acres 15% over-application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stinger (clopyralid)</td>
<td>$270/gal</td>
<td>21 oz</td>
<td>$44.30</td>
<td>$6.65</td>
<td>$166.25</td>
</tr>
<tr>
<td>Envoy (clethodim)</td>
<td>$135/gal</td>
<td>34 oz</td>
<td>$35.85</td>
<td>$5.38</td>
<td>$134.50</td>
</tr>
<tr>
<td>SureGuard (flumioxazin)</td>
<td>$125/#</td>
<td>12 oz</td>
<td>$93.75</td>
<td>$14</td>
<td>$350</td>
</tr>
<tr>
<td>Roundup (glyphosate)</td>
<td>$40/gal</td>
<td>64 oz</td>
<td>$32</td>
<td>$4.80</td>
<td>$120</td>
</tr>
</tbody>
</table>
Other costs of over-spraying

- Pollution of surface & groundwater
- Weakened or destroyed plants, turf
- Drift onto neighboring properties – damage, angered neighbors
- Penalty from IDALS, EPA
Costs of under-spraying

- Lost effectiveness – reduced or no control of target organism
- Additional pesticide application(s)?
- Pests can develop chemical resistance
Impact of one bad nozzle

• Unsprayed strips – safe haven for pests
• Worn nozzles tend to produce fine droplets, therefore susceptible to drift
• Dirty nozzles alter spray pattern – over or under applications
## Nozzle materials and wear

The table below shows the percent increase in nozzle flow rate after a 40 hour test when using flat-fan spray nozzles with different materials:

<table>
<thead>
<tr>
<th>Material</th>
<th>Percent Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermoplastic</td>
<td>0.4</td>
</tr>
<tr>
<td>Hard Stainless</td>
<td>1.2</td>
</tr>
<tr>
<td>Kematal</td>
<td>2.1</td>
</tr>
<tr>
<td>Stainless</td>
<td>6.1</td>
</tr>
<tr>
<td>Zytel</td>
<td>7.5</td>
</tr>
<tr>
<td>Brass</td>
<td>11.4</td>
</tr>
</tbody>
</table>

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Percent increase in nozzle flow rate after 40 hour test when using flat-fan spray nozzles.
Calibrating equipment...

...is worth your time and money!
STORAGE OF PESTICIDES
Security issues for storage sites

• Limited access
• Up-to-date inventory; missing product?
• Lock up pesticides, empty containers
• Lock up application equipment
• Don’t act as a chemical dealer
• Promptly report suspicious persons
Pesticide storage – location

• Avoid sensitive sites
• Should not be a part of a:
  – residence
  – animal barn
  – office building
  – feed storage area
Best storage conditions

- Well-lighted; spark-resistant fixture
- Good ventilation
- Dry, lower RH
- Temperature control between 40 – 90°F
Metal shelving
Liquids on lower shelves
Basins for possible spills, leaks
Impervious flooring

Spill pallets

Containers dated

Impervious flooring
No food, meds, clothes, fert, combustibles
Pesticide storage – best conditions

- Spill kit (shovel, plastic can, absorbent)
- Little/no carryover of product
Safety Data Sheets accessible

Safety Data Sheet

1. Identification of Preparation and the Supplier
2. Composition
3. Hazards Identification
4. First Aid Measures
5. Fire Fighting Measures
6. Accidental Release Measures
7. Handling & Storage
8. Exposure Controls/Personal Protection
9. Physical and Chemical Properties
10. Stability & Reactivity
11. Toxicological Information
12. Ecological Information
13. Disposal Considerations
14. Transport Information
15. Regulatory Information
16. Other Relevant Information
PESTICIDE SHELF LIFE
<table>
<thead>
<tr>
<th>Trade name</th>
<th>Active ingredient</th>
<th>Shelf-life</th>
<th>Storage temperatures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Envoy Plus</td>
<td>clethodim</td>
<td>2 years</td>
<td>Above 32°F</td>
</tr>
<tr>
<td>Oust Extra</td>
<td>sulfometuron methyl</td>
<td>1 – 2 years</td>
<td>Cool, dry place</td>
</tr>
<tr>
<td>Pendulum 3.3 EC</td>
<td>pendimethalin</td>
<td>3 years</td>
<td>40 – 120°F</td>
</tr>
<tr>
<td>Princep</td>
<td>simazine</td>
<td>3 years</td>
<td>Cool, dry place</td>
</tr>
<tr>
<td>Roundup</td>
<td>glyphosate</td>
<td>3 years</td>
<td>Above 10°F</td>
</tr>
<tr>
<td>Stinger</td>
<td>clopyralid</td>
<td>1 – 2 years</td>
<td>Above 28°F</td>
</tr>
<tr>
<td>SureGuard</td>
<td>flumioxazin</td>
<td>1 – 2 years</td>
<td>Cool, dry place</td>
</tr>
<tr>
<td>Surflan</td>
<td>oryzalin</td>
<td>12 – 18 months</td>
<td>None given</td>
</tr>
</tbody>
</table>
DISPOSAL OF PESTICIDES
Container disposal

• When disposing pesticide containers, triple- or pressure-rinse containers
• Puncture containers to avoid re-use
• Shake paper containers until empty
• Recycle plastic containers with vendor for Ag Container Recycling Council