Herbicidal weed control

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Total weed management program

Effective weed control

Sanitation
- Weed seed
- Weeds in non-cropland areas

Herbicide management
- Maintain chemical barrier
Weed control reality

• Weed seeds are present in soil

• You cannot eliminate all weed seed
  – Even fumigation with MeBr is only temporary relief

• Sanitation and management practices should discourage weeds from establishing
Redroot pigweed

- Plants produce up to 100,000 seed
  - 13,860 with no fertilizer
  - Over 34,600 when fertilized

- Seed can be wind dispersed
  - Small size

- Seed survive for more than 30 years
  - Soil surface or buried
Weeds

• Plants that are successful colonizing disturbed, but potentially productive, sites and maintaining their abundance with repeated disturbance.

  Liebman et al.
Landscape weed control

- Sanitation
- Mulches
- Herbicides
Herbicides in landscapes

• Preemergence herbicides
  – Apply to weed free soil
  – Apply prior to weed emergence
  – Apply uniformly and do not disrupt

• Postemergence herbicides
  – Select the correct type
  – Apply thorough coverage
Preemergence herbicides

- Most seed germinate in the top 1 inch of soil.
- Herbicide placement should occur where seeds will germinate and begin growing.
- Application of herbicide followed by incorporation with water is necessary for proper placement.
Preemergence herbicides

- **Will not** kill weeds present at time of application

- Even small weeds have roots large enough to escape effect of pre herbicides.
Preemergence herbicides

• Do not prevent seed from germinating

• Do not kill dormant seeds!!!!

• Typical herbicidal activity
  – Hypocotyl and epicotyl emerge from seed
  – Grows through chemical barrier
  – Herbicide is absorbed and weed is killed or stunted.
Weed species controlled (pre-em)

• Broadleaf-active herbicides
  – Goal
  – Princep
  – Gallery

• These herbicides provide moderate to poor control of grasses, especially at lower rates.
Weed species controlled (pre-em)

• Grass-active herbicides
  – Surflan, Pendulum, Treflan, Factor
  – Ronstar
  – Pennant

• These products provide effective control of grasses and some “small-seeded” broadleaves
Weed species controlled (pre-em)

- Broad-spectrum control
- Tank mix a grass-active herbicide with a broadleaf-active herbicide
  - Gallery + Pendulum
  - Goal + Factor
  - Princep + Surflan
Herbicide timing

- Herbicides must be applied prior to weed emergence.

- Weeds present at application will continue growing.
Maintain the chemical barrier

• Incorporate the herbicide

• Reduce unnecessary traffic

• Reduce excessive irrigation
Reduce traffic
Incorporate the herbicide

- Most abused aspect of weed control
- Incorporate immediately after application
  - Herbicides degrade on soil surface
- Incorporate with irrigation if possible
- Do NOT incorporate with drip irrigation!!!
Uniformity of application

• Mostly a problem with granular applications

• Research shows that even under ideal conditions, amount applied can be from \( \frac{1}{2} \) to 2 times the intended rate.

• Take steps to improve uniformity
Uniformity of application

- Apply a single application in multiple passes.
- Takes more time, but dramatically improves uniformity.
Improper calibration

- Herbicides control weeds at specific rates
  - Low rates provide poor control
  - High rates may cause injury
- If calibration is not accurate, rates will also be wrong
Problems with calibration

• Check for unequal distribution from nozzles
  – Nozzles must all be the same
    • Unless manufacturer specifies otherwise
  – Nozzles must be clean and working properly

• Calibrate equipment often
  – If using computer control systems, verify often.
Preemergence herbicides

• If applying to bark
  – Apply to moist bark

• Pre-herbicides applied to dry bark reduces efficacy
  – Dry bark adsorbs the herbicide tightly
  – May not be released with subsequent irrigation
  – Herbicide is rendered ineffective
Postemergence herbicides

• Select the right type of herbicide
  – Contact
  – Translocated

• Apply thorough coverage

• Ensure adequate uptake and movement
Contact herbicides

- Burns only foliage that is contacted.
- Good for control of annual weeds.
- Will not control roots of perennial weeds.
Postemergence herbicides

- Contact
  - Finale (poorly translocated)
  - Gramoxone
  - Scythe (pelargonic acid, soft pesticide)
  - Diquat
  - Acetic acid
Contact herbicides

• Require thorough coverage for complete control

• Best when used on small, recently germinated weeds.

• Not effective against established perennials.
Translocated herbicides

- Absorbed by foliage and other green tissue
- Moved throughout plant along with photosynthates
- Moved to growing points
Postemergence herbicides

- Translocated
  - Moved throughout the plant to control roots and shoots
    - Roundup – all vegetation
    - Vantage – grasses only
    - Fusilade – grasses only
    - Envoy – grasses only
    - Manage - Nutsedge
Translocated herbicides

- Require living, functioning plants.

- Environmental conditions that favor plant growth also improve effectiveness
  - High light
  - Adequate soil moisture
  - Moderate temperatures
Translocated herbicides

- Coverage is extremely important for controlling perennial weeds
  - *Convolvulus arvensis*
  - Roots grow to a depth of 30 feet.
Translocated herbicides

- Ideal for killing perennial weeds
- Best when used for spot spraying
- Will injure ornamental crops if contact is made
Which type?

- **Contact herbicides**
  - Faster action
  - Safer around ornamentals
  - Will not kill roots (perennials)

- **Translocated herbicides**
  - Slower action
  - More effective across all weed types
  - Greater potential injury to ornamentals
Postemergence herbicides

• Foliar uptake dependent on 2 factors:
  • Foliar retention
    • Ability of the herbicide to adhere to the leaf surface.
  • Cuticle penetration
Foliar retention

• Spray applications
  – Water will bead on waxy cuticle
  – Reduce water tension with adjuvants
Cuticle penetration

- Environmental factors that improve uptake
  - Any condition that causes the cuticle to hydrate
    - High humidity, warm temps, adequate soil moisture
  - Conditions that cause plants to develop thin cuticles
    - Low light, high humidity, warm temps, adequate soil moisture
  - Conditions that favor opening of stomata.
Water as a carrier

• Hard water
  – High Mg and Ca
  – Herbicides formulated as salts dissociate in water
    \[
    \text{HO-C-CH}_2\text{-NH-CH}_2\text{-PO}_2\text{-OH} \quad \text{H}_3\text{N}^{+}\text{-CH}_3
    \]
  – Mg$^{++}$ or Ca$^{++}$ can rebind to the glyphosate anion and cause it to precipitate out of solution.

• Reduce the effects of hard water
  – Add ammonium sulfate or acid
  – Reduce spray volume
‘Soft’ herbicides

• Acids
  – Many naturally occurring acids are bottled and sold as herbicides
  – All are contact herbicides
    • Burn plants to the ground, no control of root system
  – Work best on warm sunny days
    • Temps greater than 70 F (21 C)
Soft herbicides

- Acids
  - Acetic acid is vinegar
    - Ecoclear
  - Pelargonic acid
    - Scythe
  - N-phuric acid
Acetic acid

- Vinegar contains about 5% acetic acid
- Contact herbicide
- Excellent on small weeds
  - Thorough coverage is essential.
- Species specific
- Requires a surfactant
- Will burn ornamentals as well.
Natural herbicides

• Corn gluten meal
  – Mostly fertilizes weeds
  – Weeds grow better.

• Can be effective in turf.
  – Turf fertilizer
  – More vigorous turf, fewer weeds.
Soft herbicides

- Alternative to synthetic products
- They have a niche use
- Generally not as effective as synthetic counterparts
Summary

- Preemergence herbicides
  - Apply to clean, weed-free soil
  - Maintain the integrity of the chemical barrier

- Postemergence herbicides
  - Select the right product/type
  - Thorough coverage
Website

- http://oregonstate.edu/dept/nursery-weeds/