

TSU Small Farm Expo 2020

# Managing Glyphosate Resistant Weeds in Horticulture Crop Production

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## Horticulture Crop Production



- Variety of Crops
  - Vegetables
  - Small fruits
  - Fruit and nut trees
  - Ornamentals (trees/shrubs)







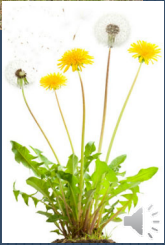
## Weed Life Cycle

- Annual
  - Complete life cycle in 1 year
  - Grow from seed
- Examples
  - Crabgrass
  - Palmer amaranth
  - Marestail
  - Dandelion

## Weed Life Cycle

- Perennial
  - Live more than 2 years
  - Regenerate from roots
- Examples
  - Dandelion
  - Nutsedge
  - Wild garlic
  - White clover
  - Dogfennel

## Weeds




- Sources
  - Existing weeds
  - Adjacent fields
  - New soil/plants
  - Farm equipment





## Weed Control Methods

- Chemical
  - Herbicides
    - Post-emergent
      - Contact
      - Translocated (systemic)
    - Pre-emergent

## Herbicide Tolerance vs Resistance

- Herbicide Tolerance
  - Natural inherent ability to survive a specific herbicide
    - Physical leaf structure prevents absorption into plant
    - Physiological process breaks down active ingredient (AI)
    - Plant lacks target site of the active ingredient
  - Examples
    - Selective herbicides (2,4-D; grass specific herbicides)
    - Horseweed – large plants do not absorb sufficient AI



## Herbicide Tolerance vs Resistance

- Herbicide Resistance
  - Inherited ability (natural or artificially introduced) of a plant to survive a herbicide treatment
    - Genetically modified through artificial methods
      - Roundup® Ready corn and soybean
    - Developed over time due to natural selection
      - Repeated herbicide applications over time
      - Weeds survive and produce seed



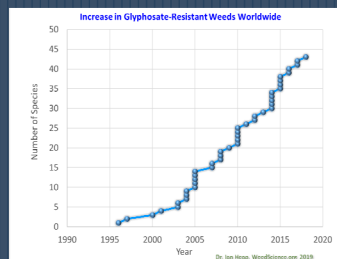
## Herbicide Resistant Weeds

- First reported in 1957
- 1964 – Field bindweed resistant to 2,4-D
- 1971 – Common groundsel resistant to atrazine (post-emergence) and simazine (pre-emergence)
- Currently
  - 262 weed species have developed herbicide resistance



## Glyphosate Resistant Weeds

- Roundup® Ready crops introduced in 1996
- Repeated applications of glyphosate over time



## Glyphosate Resistant Weeds

- United States = 17 weed species
- Tennessee = 7 weed species





## Glyphosate Resistant Weeds

- Palmer amaranth (pigweed)
  - Rapid growth
  - Drought tolerant
  - 300,000+ seeds per plant
  - Dispersal
    - Farm equipment
    - Water
    - Animals



### Glyphosate Resistant Weeds

- Horseweed (marestail)
  - Persists year round
    - Germinates in fall and spring
  - Adaptable to dry/wet conditions
  - Grows to 6 feet tall
  - 200,000 seeds per plant
  - Dispersal
    - Wind
      - Carried several miles



### Management Tools

- Sanitation
  - Remove debris from farm equipment
  - Only buy quality soil conditioners/compost
  - Remove weeds prior to flowering
  - Control weeds in surrounding fields




### Management Tools

- Cover crops
  - Prevent weed seed germination and establishment
    - Physical and chemical
  - Living mulch
  - Residual mulch
  - Improves soil
  - Most effective practices vary by crop and production method
    - Fallow fields
    - Interplanting
    - Prior to planting crop

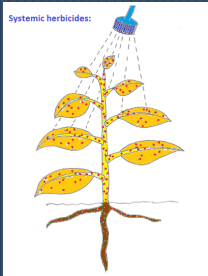
### Management Tools

- Cover crops
  - Cool Season
    - Winter Wheat
    - Cereal rye
    - Triticale
    - Crimson clover
  - Warm Season
    - Sudex grass
    - Soybeans
    - Cowpea



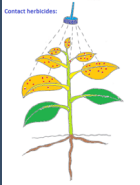
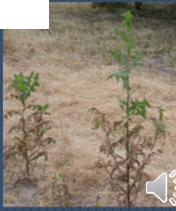
### Management Tools

- Alternative Herbicides
  - Glufosinate (Liberty®, Finale®)
    - Moderately systemic (acts as contact)
    - Best on annual weeds
  - Application
    - Spot spray (use shielded sprayer)
    - Do not contact leaves/stems of desirable plants



### Management Tools

- Alternative Herbicides
  - Diquat (Reward®)
    - Best on small annual weeds
    - Less likely to injure desirable plants
  - Application
    - Spot spray (use shielded sprayer)
    - Do not contact leaves/stems of desirable plants

## Management Tools

### Non-synthetic Herbicides

- Non-selective
- Contact
- Mode of action
  - Plant desiccant
    - Breaks down leaf cuticle
    - Disrupt cell membrane
- Work best on small annual weeds
- Application
  - Spot spray (use shielded sprayer)
  - Do not contact leaves/stems of desirable plants



## Cost Comparison

| Active Ingredient                            | Trade Name | Cost/Unit       | \$ / Acre | \$ / 1000 ft <sup>2</sup> |
|--|------------|-----------------|-----------|---------------------------|
| Glyphosate                                   | RoundUp    | \$70 / 2.5 gal  | \$28      | \$0.65                    |
| Glufosinate                                  | Finale     | \$175 / 2.5 gal | \$105     | \$2.44                    |
| Pelargonic acid                              | Scythe     | \$179 / 2.5 gal | \$377     | \$8.78                    |
| Ammonium nonanoate (pelargonic acid)         | AXXE       | \$175 / 2.5 gal | \$350     | \$8.14                    |
| Ammonium soaps of fatty acids                | Finalsan   | \$109 / 2.5 gal | \$332     | \$7.72                    |
| Caprylic and capric acid                     | Suppress   | \$219 / 2.5 gal | \$410     | \$9.54                    |
| Acetic acid (20%) - vinegar                  | NA         | \$109 / 5 gal   | \$436     | \$10.13                   |
| d-limonene                                   | AvengerAG  | \$199 / 2.5 gal | \$533     | \$12.40                   |
| Plant oils (clove, cinnamon, citric, others) | Weed-Zap   | \$98 / gal      | \$490     | \$11.40                   |



## Pre-emergent Herbicides

### Palmer amaranth

- Atrazine
- Dimethenamid-P
- Flumioxazin
- Pendimethalin

### Marestail

- Indaziflam
- Isoxaben
- Flumioxazin
- Oryzalin
- Prodiamine
- Simazine



## Pre-emergent Herbicides

### Maximize Success

- Start with weed-free surface
- Proper timing
- Proper sprayer calibration
- Activate with rain/irrigation (>0.25")
- Rotate MOA



## Thank You!!

Questions??

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