Pre-emergent Herbicide Options for Onions

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Outline

- Problematic weeds in onions
- Pre-emergence herbicides and herbicide groups
- Herbicide resistance and management
- Onion PREs & research update
Plant Characteristics

**LEAF TYPES**
- Opposite
- All basal
- Alternate
- Whorled
- Toothed
- Not toothed
- Entire
- Lobed
- Pinnate
- Palmate

**LEAF TYPES**
- Simple
- Compound

**DIFFERENT TYPES OF ROOTS**
- Fibrous
- Tubercular
- Taproot

**ROOT TYPES**
- Midrib
- Blade
- Blade margin
- Ligule
  - A. hairy
  - B. membranous
  - C. absent
- Collar margin
- Auricle
  - A. with
  - B. without
- Sheath margins
  - A. flat stem
  - B. triangular stem
  - C. round stem
Broadleaf and Grass Weed Seedling Identification Keys

BROADLEAF WEED SEEDLING IDENTIFICATION KEY

Terminology:
- Opposite Leaves: Attached at same node on opposite sides of stem. Leaves at the same node are of similar size.
- Alternate Leaves: One leaf per node. Leaves increase in size from top to bottom.
- Cotyledon Shapes:
  1. Linear
  2. Oval
  3. Round
  4. Spatulate
  5. Oblong
  6. Heart/Kidney

Vegetative Broadleaf Plant Parts:
- First true leaves
- Leaf tip
- Ochrea
- Midvein
- Cotyledon

(1) Linear Cotyledons: Much longer than wide.

- First true leaves alternate
- No ochrea
- Small cotyledons, no unpleasant odor when crushed
- True leaves alternate
- True leaves linear
- True leaves not linear
- True leaf surface appears whitened, red-violet on underside

Species:
- Jimsonweed
- Redroot Pigweed
- Smooth Pigweed
- Buffalo Bur
- Pennsylvania Smartweed
- Wild Buckwheat
- Kochia
- Russian Thistle
- Common Cocklebur
- Common Lambsquarters
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Common Lambsquarter

- Cotyledons and seedling leaves have mealy gray cast
- Green, inconspicuous flowers without petals
- A utricle with a thin papery overing over the seeds
- Short, much-branched taproot
Puncturevine

- “Stickers”; “goathead”
- Summer annual broadleaf
- Extensive root system, forms dense mats
- Yellow flowers, five petals
- Fruit- sharply pointed burrs
Barnyardgrass

- Leaves - rolled in the shoot, smooth
- Ligules - none
- Auricles - none
Yellow Nutsedge

- Perennial, belongs to sedge (Cyperaceae) family
- Native of North America
- Favors wet environment
- Seedhead yellowish-brown or straw color
• Forms brown to tan-colored tubers at the tips of rhizomes

• A single tuber can produce about 1,900 plants and over 7,000 tubers in a growing season
Yellow nutsedge in onion field
Kochia

- Family “Chenopodiaceae”
- Early & extended emergence
- High yield losses (up to 95%)
- Aggressive growth (*C4* plant)
- High degree of outcrossing and pollen-mediated gene flow
- Prolific seed producer (>100,000 seeds/plant)
- Tumbling “seed dispersal”

Photo courtesy: Phil Stahlman, K-State

Friesen et al. 2009; Stallings et al. 1995; Kumar et al. 2019
Russian Thistle

- Stems have reddish or purple stripes
- Leaves are alternate, long, and very thin or needle-like
- Flowers are small and inconspicuous and develop in the upper leaf axils
- Mature plants break off at ground level and “tumble”
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Pre-emergent herbicides
Pre-emergent herbicides

- Prevent seedling establishment
- Won’t kill weed seeds
- Inhibit the growth of root or shoot, or both
- Need incorporation to the soil by irrigation or rainfall
- Stay in the soil for a while (residue effect), degrade after ~8 to 12 wks
Herbicide groups

- **MOA**: mode of action, the way herbicide affects a plant, controls the susceptible plant
- **SOA**: site of action, a specific process in a plant that herbicide disrupts to interfere with plant growth and development
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Herbicide resistance

- **Definition**: The inherited ability of a plant to survive and reproduce following exposure to a dose of herbicide normally lethal to the wild type.

- A consequence of selection pressure imposed by continuous use of the SOA
How quickly can you lose a technology?

Year 1
- This is the result of one escaped weed from the previous year.
- Growers may recognize they have a problem but often say, “I think I can get one more year out of glyphosate”.

Source: Dr. Jason Norwood, University of Arkansas Professor of Weed Science

Year 2
- This is the same field in Year 2, after ignoring the problem and continuing with glyphosate for another year.
- Seed from uncontrolled glyphosate-resistant Palmer amaranth were spread with harvest equipment the previous year.

Source: Dr. Jason Norwood, University of Arkansas Professor of Weed Science

Year 3
- This is the same field in Year 3 after continuous use of glyphosate.
- Glyphosate-resistant Palmer amaranth had spread over the entire field resulting in complete crop loss.

Source: Dr. Jason Norwood, University of Arkansas Professor of Weed Science

Be Proactive, Don’t Allow a Buildup of Resistance!
Herbicide-resistant weeds in PNW

- Group 5, 6,7 (PSII-inhibitor) herbicides in mint and grass seeds
- Group 1 (ACCase), Group 9 (EPSP synthase) herbicides in vegetables

*Although there are no known herbicide resistant Canada thistle in the PNW, it is a critical export contaminant.*
Integrated Weed Management (IWM)

- Using multiple control tactics
- Include many methods in a growing season to allow producers the best chance to control troublesome weeds

IWM is composed of mechanical, cultural, chemical and biological tactics (credit: GROW)
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# Pre-emergent Herbicide Options in Onions

<table>
<thead>
<tr>
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<th>Trade Name</th>
<th>Rate (lb ai/A)</th>
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Please check the label before use!
Onion

Joel Felix
Revised: March 2022

This article includes information on dry bulb and green onions, leeks, shallots, and spring onions.

- Preplant
- Preemergence, Delayed Preemergence, Early Postemergence
- Postemergence
- Sprout Inhibition
### Herbicide treatment tested in 2023

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# Weed Control % in 2023 season

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Different letters within a column indicate significant difference (p<0.05)
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## Weed Control % in 2023 season

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Different letters within a column indicate significant difference (p<0.05)
Onion grade and yield

![Graph showing yield for different onion grades across treatments](image)

- **Pre Pack Yield**
- **Med Yield**
- **Jumbo Yield**
- **Cull Yield**

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<tr>
<th>Treatment #</th>
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</table>
Onion grade and yield

![Bar graph showing Onion grade and yield](image)

- **Yield (ton/a)**
- **Treatment #**
- **Marketable Yield**

The graph illustrates the yield of onions across different treatments, with bars indicating the marketable yield in tons per acre for each treatment.
Summary

- Herbicide treatments had no significant injury on onion, except for Dacthal (3-5%).
- Overall, weed control % decreased as the season progressed.
- Dacthal provided excellent control on puncturevine (92-95%) throughout the season.
- Control % on redroot pigweed did not differ from low and high rates of different herbicides, ranging from 65% to 85%, except Nortron at 8 fl oz/a (27%). Similarly, for lamsquarter control.
Thank You!

Email: rui.liu@wsu.edu
Office: 509-786-9354
Twitter/ X: @IAREC_weeds