



**My Perspective on Managing Herbicide
Resistant Weeds – The Art of War**

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February 5, 2019

The Art of War (Sun Tzu)

- If you know the enemy and know yourself, you need not fear the result of a hundred battles.
- If you know yourself but not the enemy, for every victory gained you will also suffer a defeat.
- If you know neither the enemy nor yourself, you will succumb in every battle.

Crop Rotation Remains Very Important

- Small grains
 - Most difficult grass control
- Pulse crops
 - Most limited crop for herbicides
- Corn
 - Most options of any crop
- Soybean
 - More options than ever before
 - Stolen from corn



Horseweed (Marestail)

A photograph of a soybean field. The majority of the plants are green soybeans with characteristic trifoliate leaves. In the center of the field, several tall, upright plants with numerous small yellow flowers are visible, identified as horseweed (Marestail). The background shows a line of trees under a clear sky.

Horseweed, Mareetail, Canada fleabane – *Erigeron canadensis*



http://www.ppws.vt.edu/scott/weed_id/erica.htm

Horseweed Biology



- Classified as a “Pioneer Species”
- Winter annual AND summer annual
 - Overwinters as rosette, no rosette formation for spring germination
 - Can germinate as long as the ground is not frozen
 - Fall plants tough to control in spring
- Small, wind-dispersed seed
- Self-pollinated
- Average 80,000 seed in direct competition with soybean
- Widespread Glyphosate and Group 2 resistance in most of US



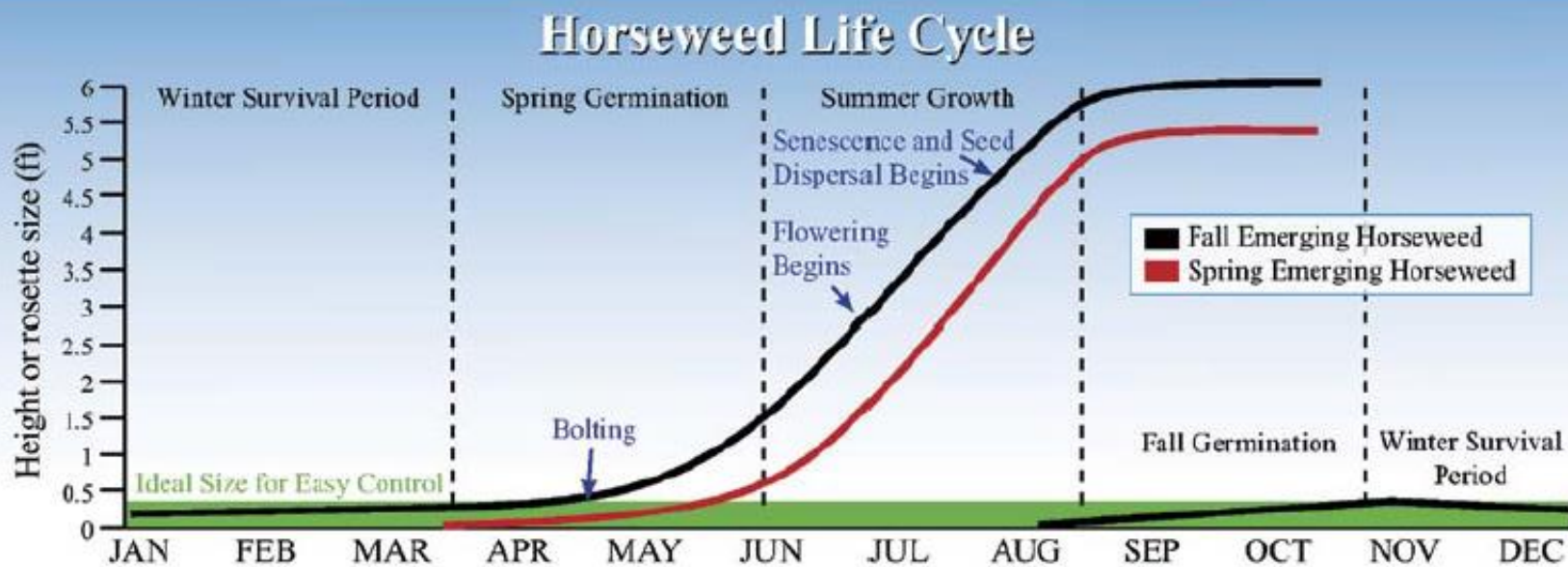


Figure 4. This graph shows the relative life cycles of horseweed throughout the year for plants that emerge in the spring and fall.



Main Emphasis of Marestalk Education for this Winter

- We have to be more aggressive with our burndown programs
 - Mindset needs to be MULTIPASS!
 - There are more robust programs than simply adding a pint of 2,4-D to something
- If we have glyphosate + ALS resistance
 - Grow corn or wheat.....
 - Use different herbicide resistance trait in soybean
 - Liberty Link
 - RR2 Xtend
 - Enlist soybean



Marestail Management Principles

- Field must be free of marestail at time of planting
 - Plan on a 2 pass burndown program
 - Paraquat + metribuzin + group 4, Sharpen products
 - Do not rely on glyphosate or 2,4-D alone
 - Dicamba and Elevore slightly better than 2,4-D
 - Thorough tillage close to time of planting

- Need residual marestail control for 6 to 8 weeks after planting
 - Apply residual (PRE) herbicides in spring
 - Broad-spectrum products that contain full rate of metribuzin (5 oz or more), Valor, Authority

- If you have “multiple resistant” glyphosate and ALS resistant marestail, you have no postemergence options in straight RR2Y soybeans



Comparison on Horseweed

Pictures taken 14 days after POST application at Glyphosate-Resistant site 2015



**Halauxifen-methyl 1 oz/A at
14 DBP**



**Dicamba 0.25 lb/A at
14 DBP**



2,4-D 0.5 lb/A at 14 DBP

Kochia



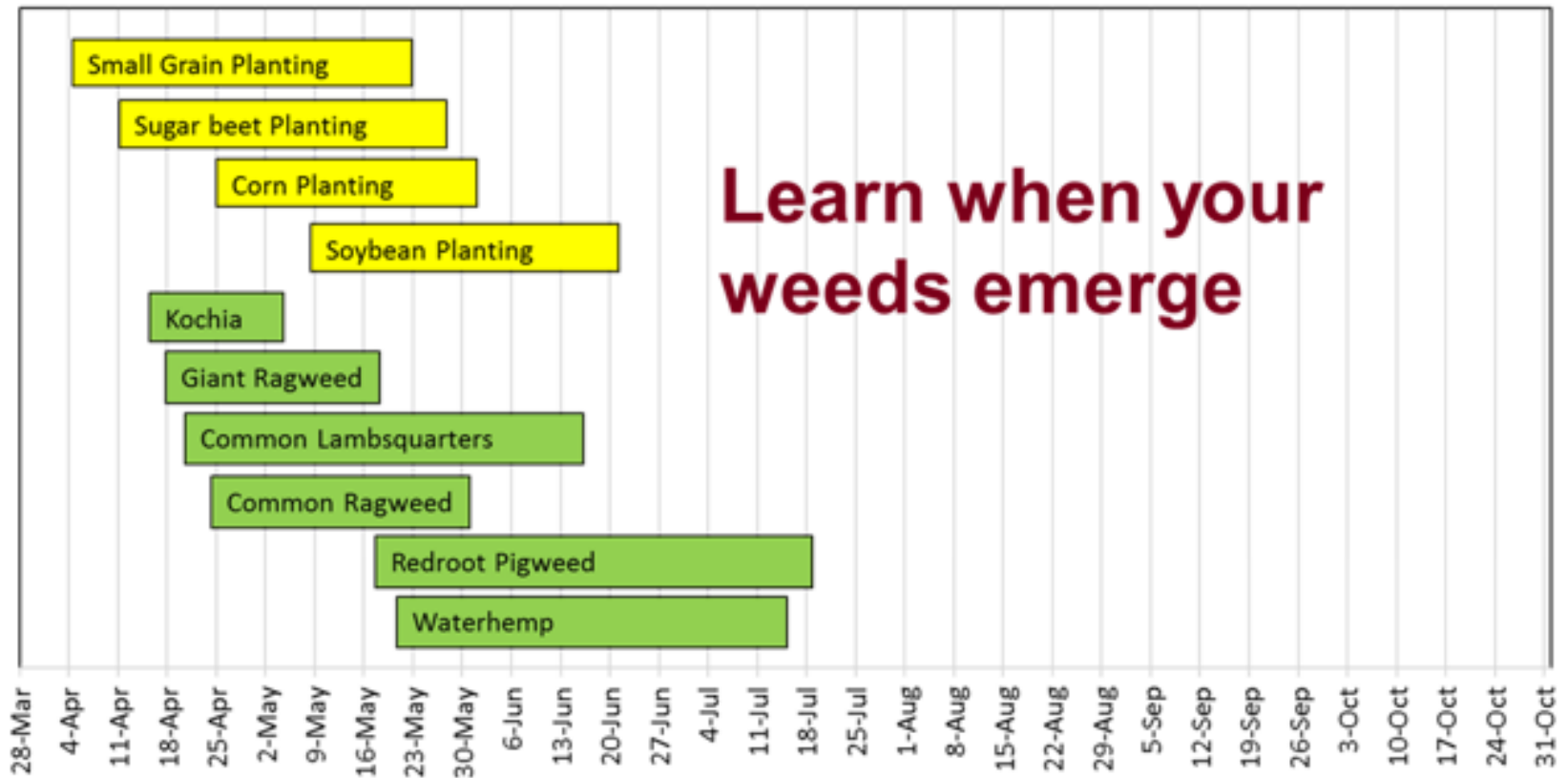


Photo courtesy: Dr. Phil Stahlman, KSU

Key:

Crop Planting

Emergence Period



Adapted from Werle et al. 2014 and Goplen et al. 2017

Kochia Biology

- Goosefoot family – Lambsquarters, Russian thistle
- First plant to germinate in spring
 - “Mats” wherever seed fell off mature plants
 - We have selected for later germinating populations
- Thrives in dry conditions, saline soils
- Tumbleweed – 30,000 seed per plant
- Most seed not viable after one year
 - Only 1% viable after two years



Kochia Management Challenges

- Widespread ALS (Group 2), 2,4-D, MCPA resistance
- Glyphosate-resistance increasing
- Potential dicamba and Starane (fluroxypyr) resistance being investigated
- Extended germination window creates control issues
 - Layered residuals
 - Zidua

Kochia Management Principles

- Field must be free of kochia at time of planting
 - Plan on a 2 pass burndown program (Fall fb Spring)
 - Valor = best in the fall, save sulfentrazone for spring
 - Paraquat + metribuzin + group 4, Sharpen products
 - Thorough tillage close to time of planting
- Need residual kochia control for 6 to 8 weeks after planting
 - Apply residual (PRE) herbicides in spring
 - Valor, Authority, Zidua products in appropriate crops
- Effective POST herbicide
 - No POST options in pulse crops
 - Atrazine + Group 27 in corn
 - Flexstar in any soybean (if allowed). Otherwise:
 - Xtend soybean



Kochia

**Valor + Metribuzin +
2,4-D**

4 oz + 4 oz + 12 oz

Applied Nov 16, 2016

Picture June 5, 2017

Photo: Tom Gardner,
Valent



Amaranthus species (PIGWEEEDS)

- **Waterhemp continues to be problematic in eastern North Dakota**
- **Palmer amaranth is the new kid on the block**
- **Redroot/smooth pigweed still most common state-wide**
 - **ALS-resistance (Group 2) only**



Palmer Amaranth in the Cornbelt

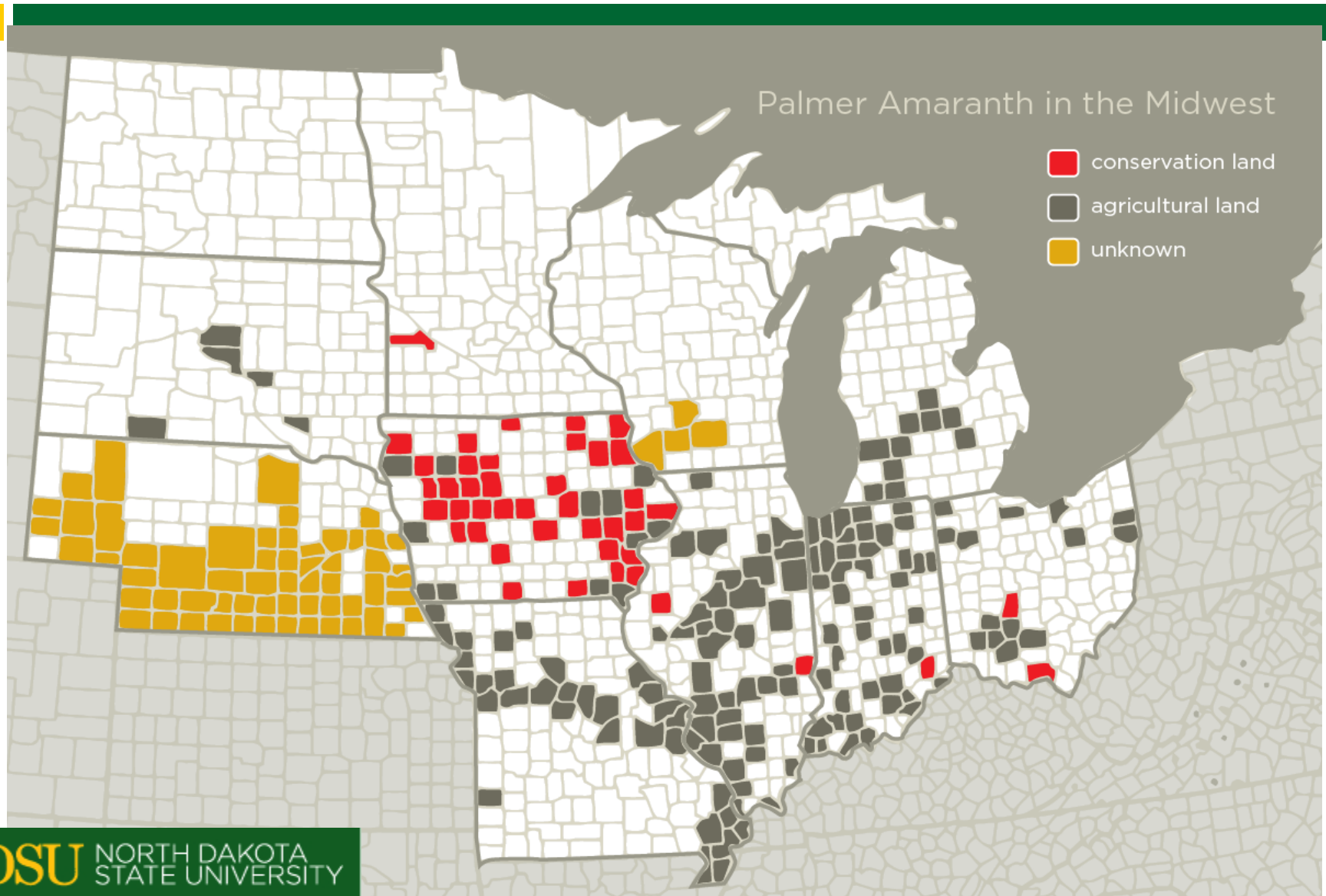


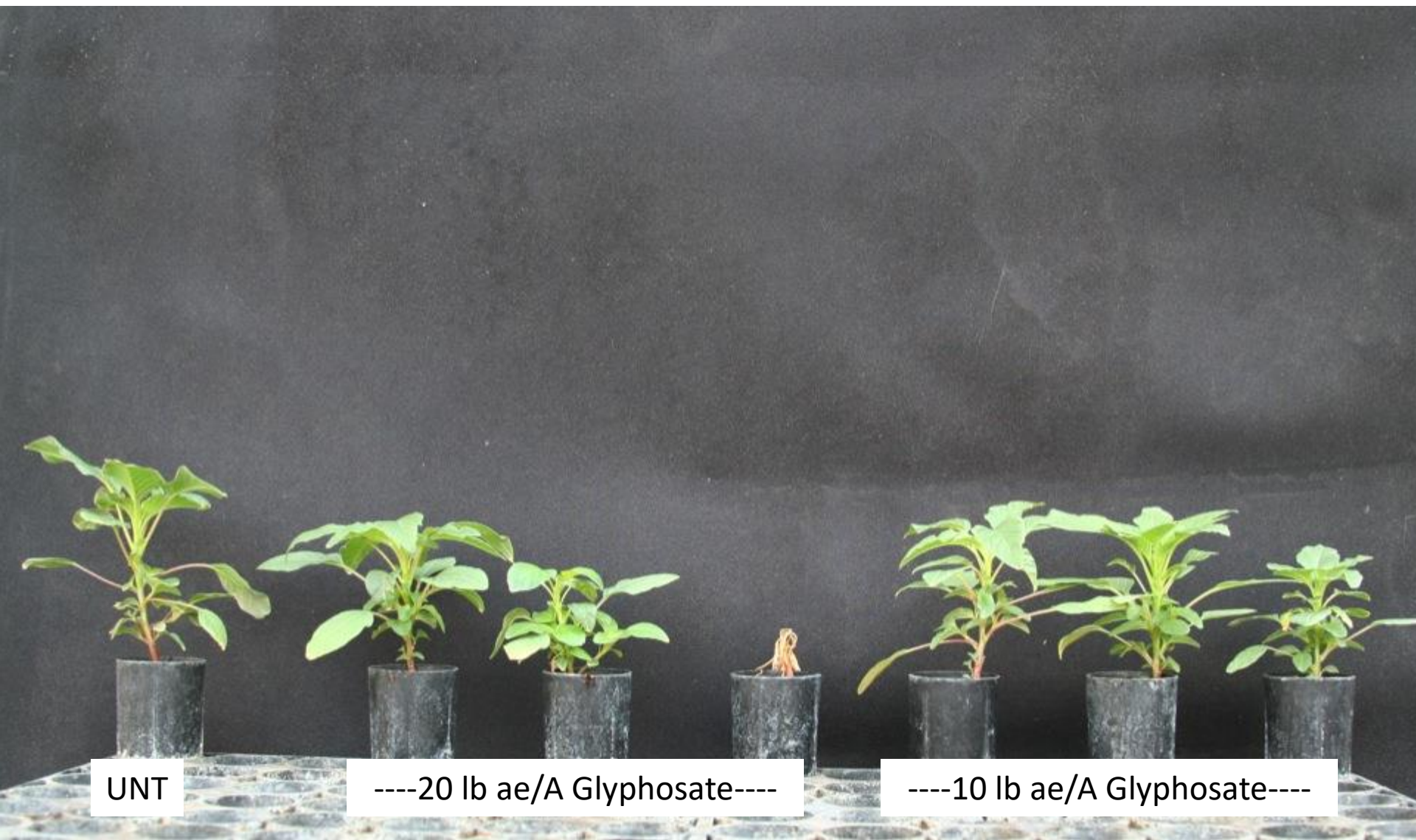






Photo credit: Tom Barber, University of Arkansas





UNT

----20 lb ae/A Glyphosate----

----10 lb ae/A Glyphosate----

Questions?



