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Question: How long should we allow weeds to interfere with corn?



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WEED INTERFERENCE

Interference = competition + allelopathy

Crops and weeds compete for:

- ☐ Water (most important)
- ☐ Light
- ☐ Nutrients
- ☐ Air
- ☐ Space



Allelopathy: the production of biomolecules by one plant that induce suffering or give benefit to another plant

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WEED COMPETITION

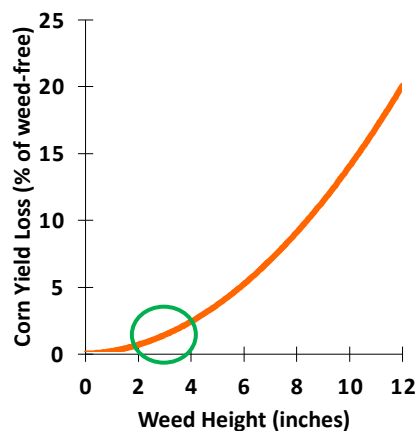
Level of competition depends on:

- ☐ Soil and environmental factors
- ☐ Weed-crop emergence timing
- ☐ Weed species and density
- ☐ Duration of competition
- ☐ Crop cultivar
- ☐ Planting date
- ☐ Crop row spacing



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Relationship between corn grain yield and weed size at the time of weed removal. Data from 35 field sites. Adapted from Gower et al. 2003

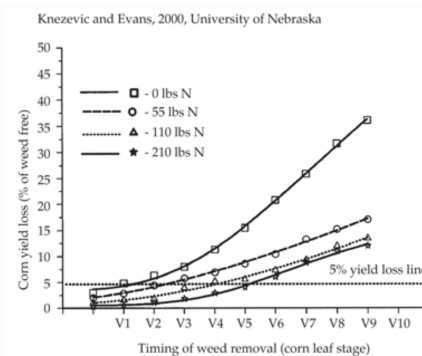


Figure 1. Corn yield loss and beginning of the critical period of weed control as influenced by the timing of weed removal and nitrogen rate.

Where does the yield loss come from?

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Principles of POST herbicides in Corn

Corn yield maximized when POST herbs:

- ❑ Applied timely to avoid any weed competition a preemergence herbicides, or

To avoid yield loss from early-season weed competition:

- ❑ Use a broad-spectrum PRE herbicide
- ❑ Apply post herbicides when weeds are no more than 4 inches tall, or before
 - ❖ Approximately 23 days after planting
 - ❖ V2-V3 stage of corn growth

Slide adapted from Dr. William G. Johnson, Ph.D., Professor, Fellow

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What do we know about weed interference in corn?

Lot's of data about removal timings and yield loss!

❑ Macronutrients

- ▣ Weed interference can reduce the macronutrient content of corn plants. *(Gonzalez Ponce and Salas, Jordan et al., Hellwig et al., Ott et al.)*
- ▣ Macronutrient content of corn plants is affected by the amount of corn leaf area produced early in the growing season, and the length of time the corn leaves are functioning.
.....but what if the corn Shoot:Root ratio has changed?

❑ Stress Interactions

- ▣ Corn dry matter was reduced by approximately 20% when corn was under low N or drought stress.
- ▣ Corn dry matter was reduced by approximately 50% when the stresses were combined. *(Tollenaar et al. 1997)*

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Nutrient Accumulation in Weeds

➤ K and Fe accumulated the fastest

Harre & Young (2020) J. Plant Nutrition, 43:1887-1906
Harre et al. (2014) Weed Sci. 62:588-596

Table 3. Initial nutrient concentration of waterhemp (AMATU) and giant foxtail (SETFA) at 10, 20, 30, and 45 cm weed heights.

Species	Height	N	P	K	Ca	Mg	S
	cm	%					
AMATU	10	2.52	0.32	2.27	1.05	0.65	0.34
	20	2.02	0.37	1.99	0.99	0.68	0.35
	30	1.48	0.27	1.74	0.88	0.52	0.25
	45	1.35	0.28	1.71	1.16	0.57	0.26
SETFA	10	3.31	0.19	2.50	0.40	0.37	0.21
	20	3.05	0.20	2.75	0.43	0.51	0.22
	30	2.68	0.17	1.46	0.45	0.47	0.19
	45	2.49	0.14	1.93	0.64	0.48	0.18
LSD ^a		0.18	0.02	0.16	0.09	0.04	0.02

^a Fisher's protected LSD ($\alpha = 0.05$).

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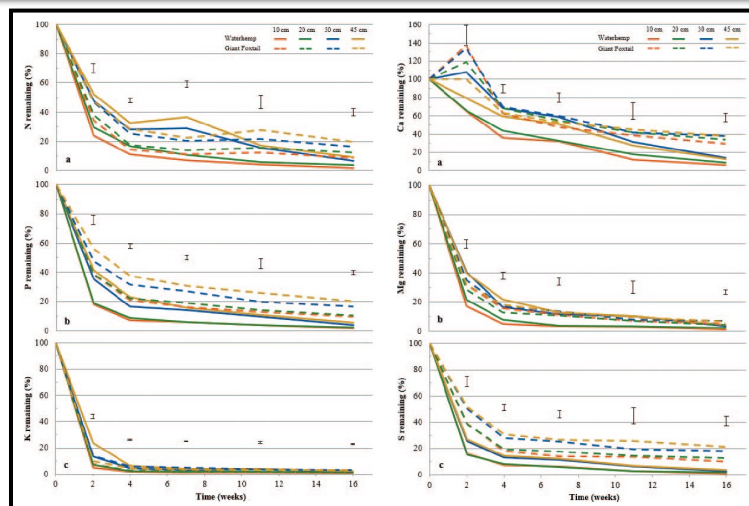
Nutrient Release from Decaying Weeds

➤ 50% or more released within two weeks

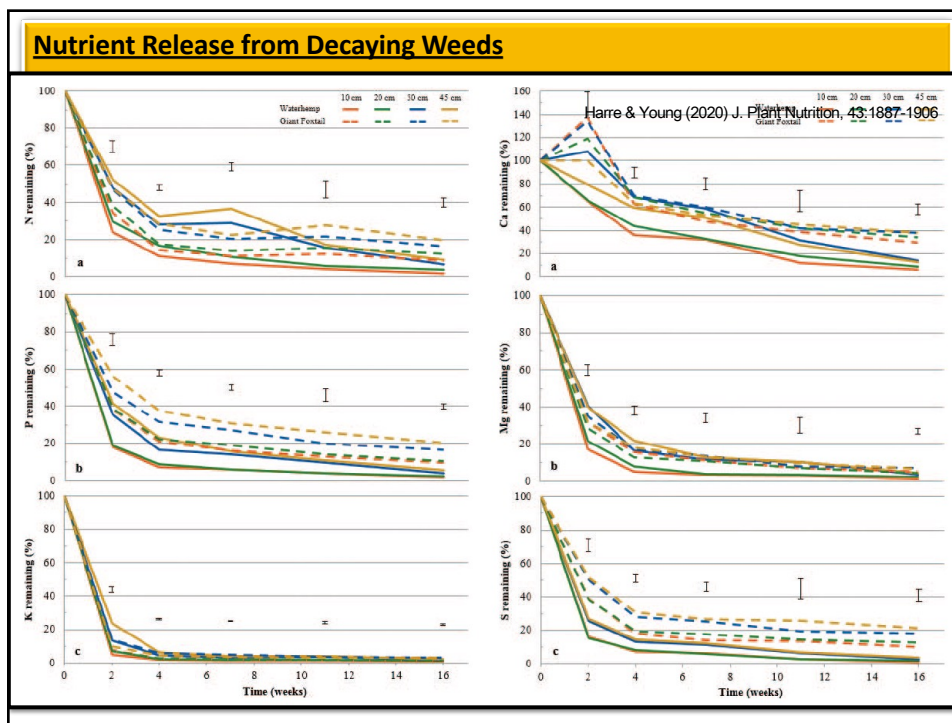
❖ Delayed with greater weed heights

➤ Ca release was much slower than other nutrients

Harre & Young (2020) J. Plant Nutrition, 43:1887-1906



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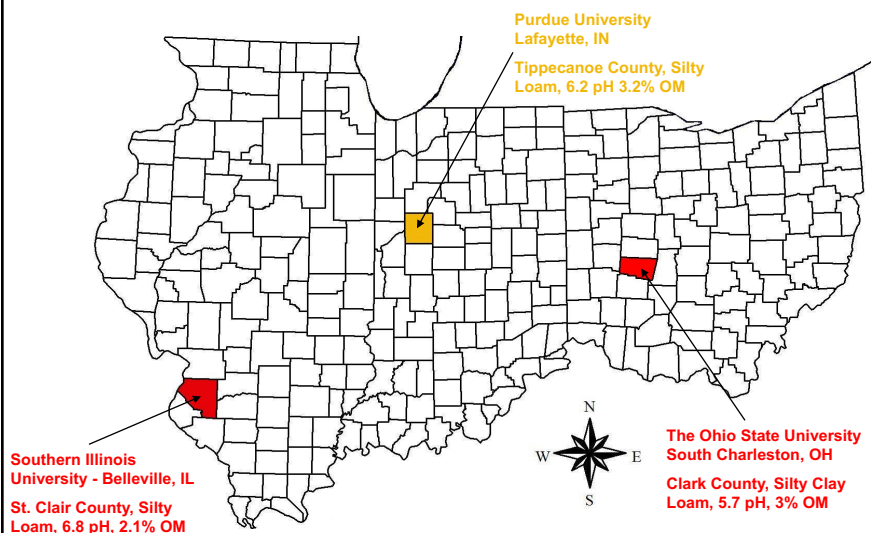
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PRE herbicide study OSU, Purdue, SIU

- How much PRE herbicide is needed in PRE + POST programs for Liberty Link, glyphosate-resistant corn?
- PRE herbicides
 - None
 - Atrazine - 1 lb ai/A
 - Bicep II Magnum - 1.2 qt/A
 - Lexar - 3 qt/A
- 3 POST glyphosate timings
 - 12-inch corn, 1 week later, 2 weeks later
 - Glyphosate rate = 0.75 lb ae/A (22 oz Roundup OriginalMAX)

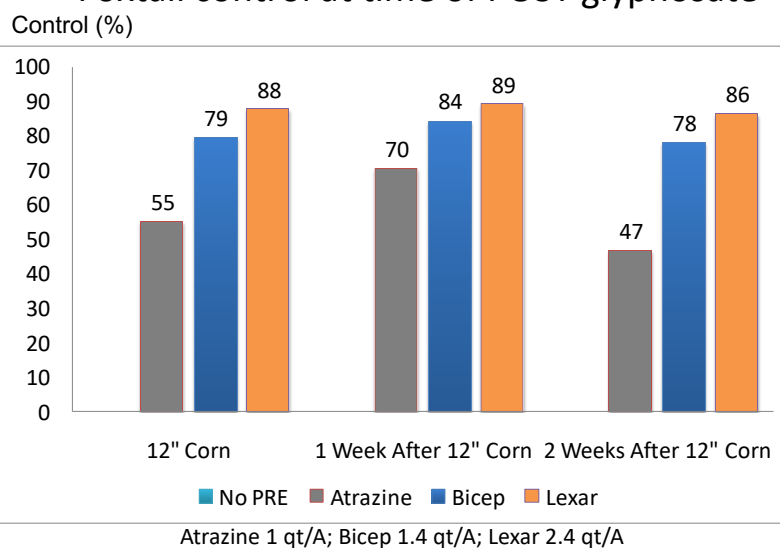
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Purdue/OSU/SIU Corn Timing Study Locations 2007 and 2008

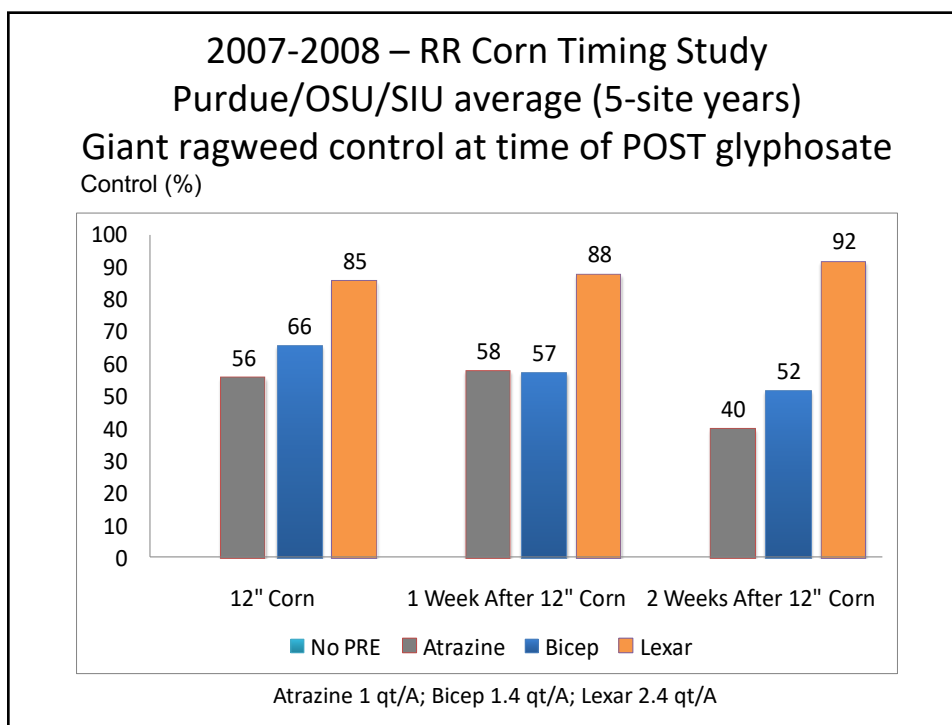


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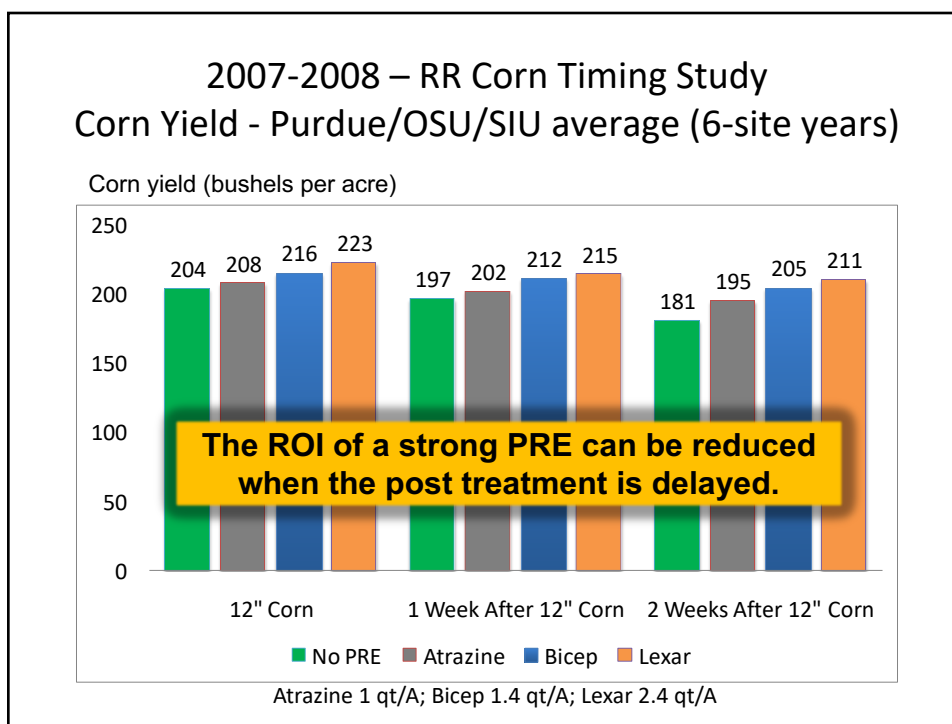
2007-2008 – RR Corn Timing Study Purdue/OSU/SIU average (6-site years) Foxtail control at time of POST glyphosate



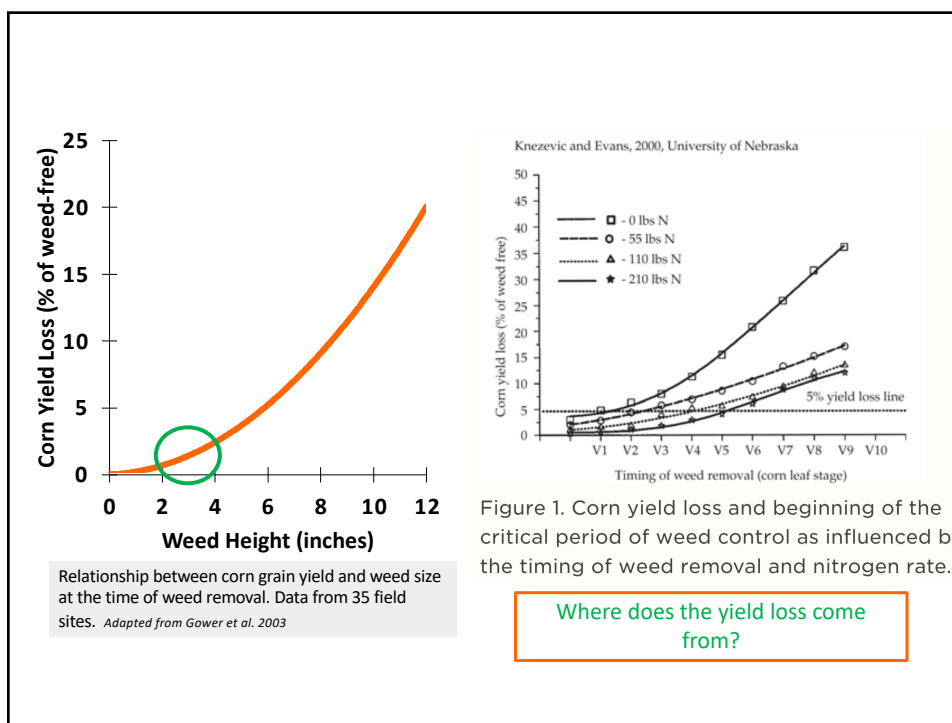
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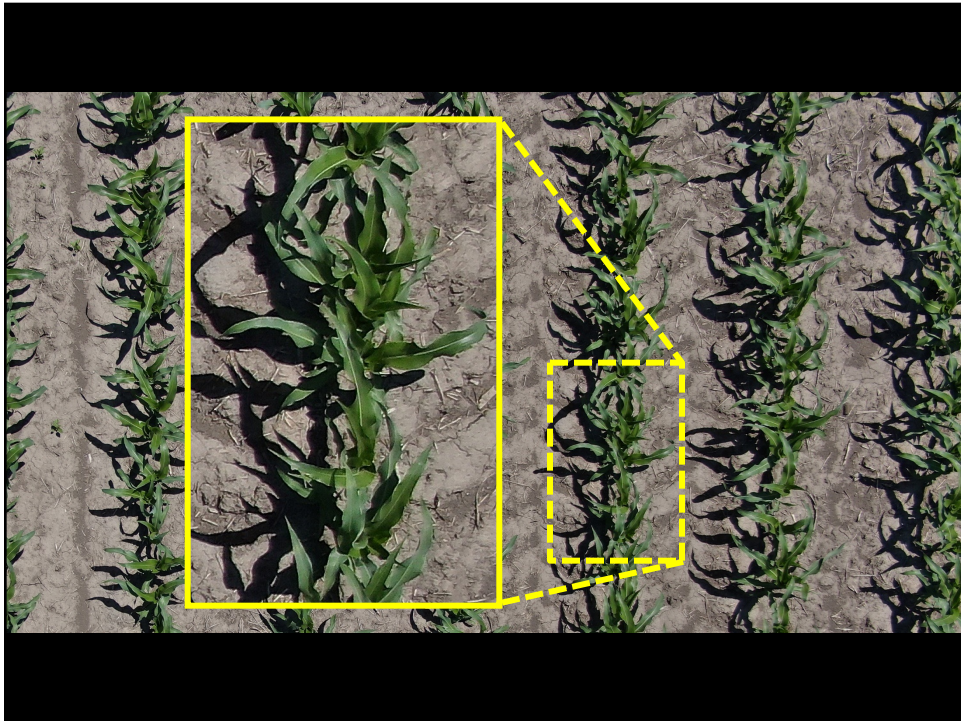
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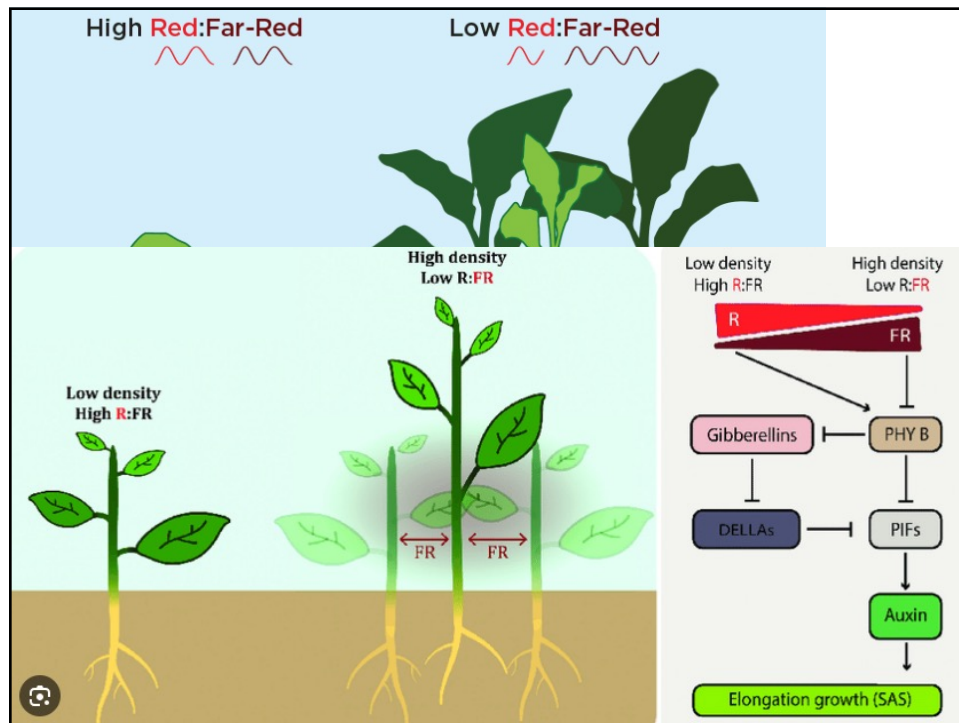
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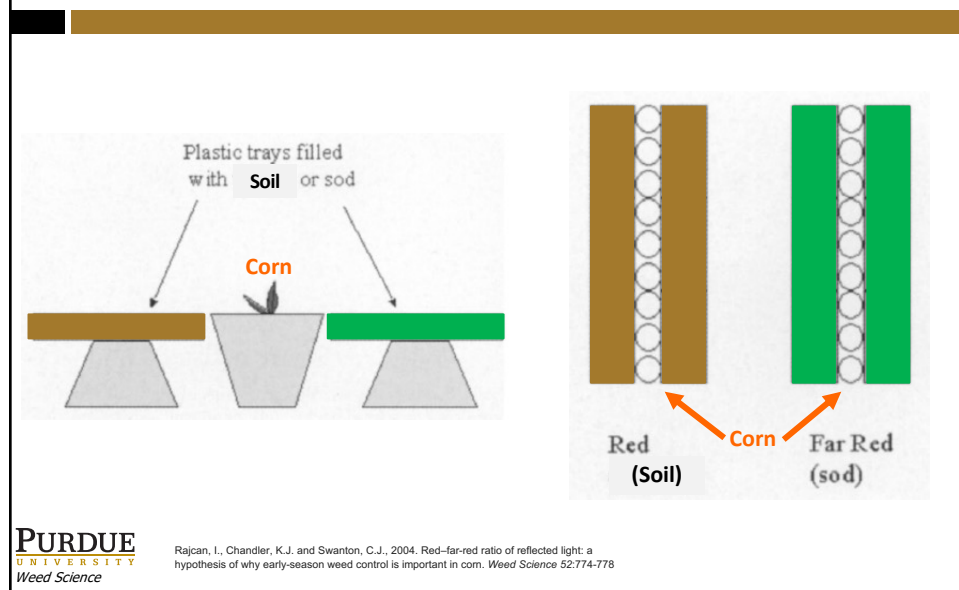
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Red:Far-Red Ratio of Reflected Light:

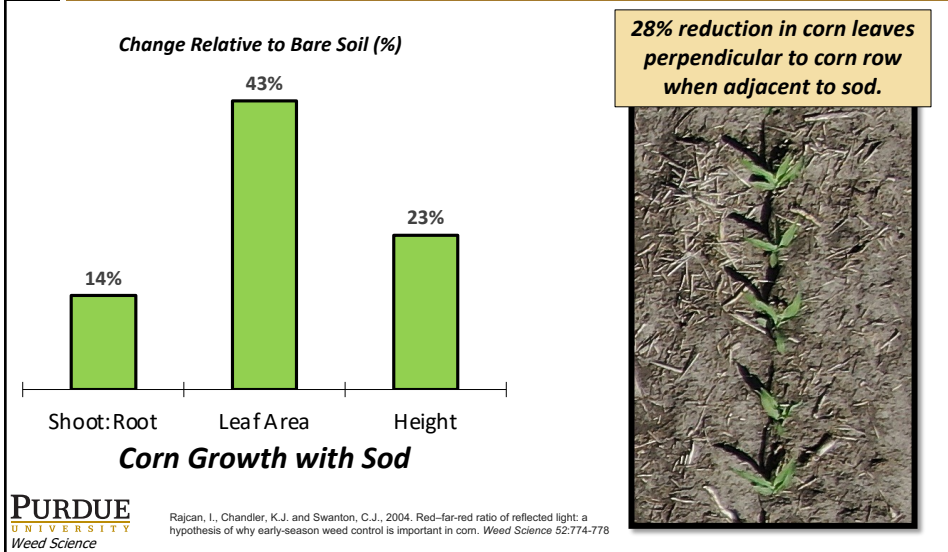
A Hypothesis of Why Early-Season Weed Control Is Important in Corn



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Red:Far-Red Ratio of Reflected Light:

A Hypothesis of Why Early-Season Weed Control Is Important in Corn



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Implications for Corn Production

- ☐ Weed **interference** includes light in addition to soil resource competition
 - ☐ Lower relative root growth would limit resource acquisition from the soil
 - ☐ Delayed leaf orientation to perpendicular to crop row would reduce season-long light capture
- ☐ If another 2-4 bu/acre is important, farmers should avoid weeds growing with corn early in the season.
- ☐ If **you** can see the weeds, so can your **corn**!

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Cover Crops - Planting Green Success

- ☐ Easier accomplished in soybeans than corn
- ☐ Corn challenges related to nutrient tie-up and insects
- ☐ Do we understand all the important factors?



Image 2. Picture of experimental plots taken, 2-July, 2021.


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Question: How long should we allow weeds to compete with corn?

Answer: We don't want **any** interference.



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WEED OUT RESISTANCE

- Know Your Weeds
- Know Weed Growth
- Know Weed Seed Characteristics
- Know Herbicide Resistance

IN THE FIELD

- Rotate Crops
- Use Multiple Herbicide Sites of Action
- Incorporate Tillage Practices


SPRAY ATTENTION

- Know Herbicide Site of Action and Properties
- Manage Drift
- Know Environmental Conditions
- Know Your Neighbors

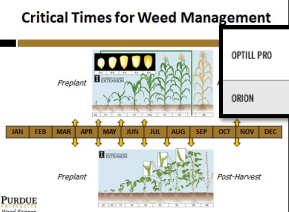
THE BOTTOM LINE

- Manage Risk
- Know Cost-Benefits of Practices
- Know the Cost of Poor Weed Control

Weed Seed Management


Critical Times for Weed Management



Product	Active Ingredient	Brand Name
OPTILL PRO	sulfentraclor	Sharpen
	imazethapyr	Pursuit
	dimethenamid-P	Outlook
ORION	florasulam	ORION
	MCPA	MCPA




Supported by:



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Thank You!

Questions?

2023 Indiana CCA Conference

Bryan Young

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