Wrangling Weeds Within Potatoes

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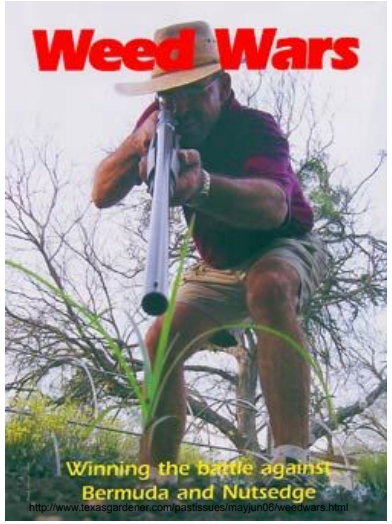
Weeds

- Weeds can cause up to 73% yield loss in potato.
- IPM to battle weeds
- Herbicide resistance

How do you win the weed war?



Integrated pest management

Integrated Weed Management is defined as the use of a range of control techniques, embracing physical, chemical and biological methods in an integrated fashion without excessive reliance on any one method (Powles and Matthews, 1992).

Weed control methods (the toolbox)

- Prevention
- Cultural
- Mechanical / physical
- Chemical
- Biological

Prevention and cultural management

- Crop rotation
- Planting configuration
- Removing debris and soil from equipment
- Proper watering and fertilizing of crop
- Growing competitive plants

Rented land – what ask about

- Previous crops
- Tillage practices
- Herbicides used
- Common weeds
- Weed control problems

Mechanical and physical weed control

- Tillage / hilling
  - Remove emerging weeds
  - Reshape hill
  - Incorporate herbicides
- Hand weeding
  - Kills all weeds – no resistance to this method

Historical Primary Weed Control Method

Product region (US)	Mechanical (%)		Chemical (%)	
	1964	1969	1964	1969
Western	93	70	3	10
Central	97	90	2	5
Southern	80	30	-	-
Northeast	50	20	20	20
				(Dallyn, 1971)

Preemergence modes of action

Mode of Action	Group	Herbicide(s)	Year reported or registered	Water solubility (mg/L)	Half life (days)
ALS inhibitors	2 / B	rimsulfuron / Matrix	1992	<10	3
Microtubule assembly inhibition	3 / K1	trifluralin / Treflan ethalfluralin / Sonalan pendimethalin / Prowl	1960 1974 1974	0.3 0.3 0.3	164 34 44
Lipid synthesis inhibition	8 / N	EPTC / Eptam	1957	370	9
PS II inhibitors	5 / C1 C2	metribuzin / Metribuzin linuron / Linex	1964 1962	1100 75	21 60
PPO inhibitors	14 / E	flumioxazin / Chateau fomesafen / Reflex Sulfentrazone	1989 1983 1998	2 50 780	15 100 211
Inhibition of VLCFAs	15 / K3	dimethenamid / Outlook metolachlor / Dual Pyroxasulfone / Zidua	1993 1972 2019	1174 488 3.5	20 40 16-26

Postemergence modes of action

Mode of Action	Group	Herbicide(s)
Lipid synthesis inhibition	1 / A	clethodim / Select sethoxydim / Poast
ALS inhibitors	2 / B	rimsulfuron / Matrix
PS II inhibitors	5 / C1, C2	metribuzin / Sencor
Growth regulators	4 / O	2,4-D*
*Fresh market reds		

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Microtubule assembly inhibition	**3 / K1**	**pendimethalin / Prowl****
Inhibition of VLCFAs	**15 / K3**	**metolachlor / Dual****
Lipid synthesis inhibition	**8 / N**	**EPTC / Eptam****
** preemergent, can be applied post		

Selection herbicides

- Variety sensitivity
  - Minituber/NFT sensitivity
- Weed spectrum
- Timing
- Cost of herbicide and application
- Rotation restrictions

Tips for maximum efficacy

- Incorporate (tillage or water)
- Timing
  - PRE: prior to emergence (follow label)
  - POST: small weeds, <1 inch tall is ideal
- Use adjuvants with POST herbicides
- Tank mix herbicides to improve weed control spectrum

Soil factors for preemergence herbicides

- pH
- Organic matter
- Soil texture
- Soil moisture

Timing of herbicides

- 3 – 5 week window for PREs
- Program could include:
  - Tillage / field preparation
  - Planting
  - Hilling
  - Herbicide prior to emergence
  - Postemergence herbicide

How to optimize weed control?

- Use an integrated weed management approach with many tools.
  - Tillage
  - Best herbicides at right time
  - Cultural management practices
  - Do not encourage herbicide resistance

Preventing herbicide resistant weeds

- Single MOA exerts greater selection pressure
- Multiple MOA
- Full label rate
- Rotation
- Tillage
- Spray small weeds

ALS inhibitors, Matrix (2)

- Inhibit production of acetolactate synthase enzyme
- pH
  - Water solubility increases as pH increases
- Broken down by acid hydrolysis
  - pH > 6.8 = no hydrolysis
  - As temperature increases and pH decreases below 6.8, hydrolysis increases.
- At pH > 6.8 increased herbicide activity

Dinitroanilines (3)

Sonalan, Prowl, Treflan

- Inhibit cell division
- Strongly adsorbed to soil colloids and OM
- Persist in dry soils

PS II inhibitors (Metribuzin)

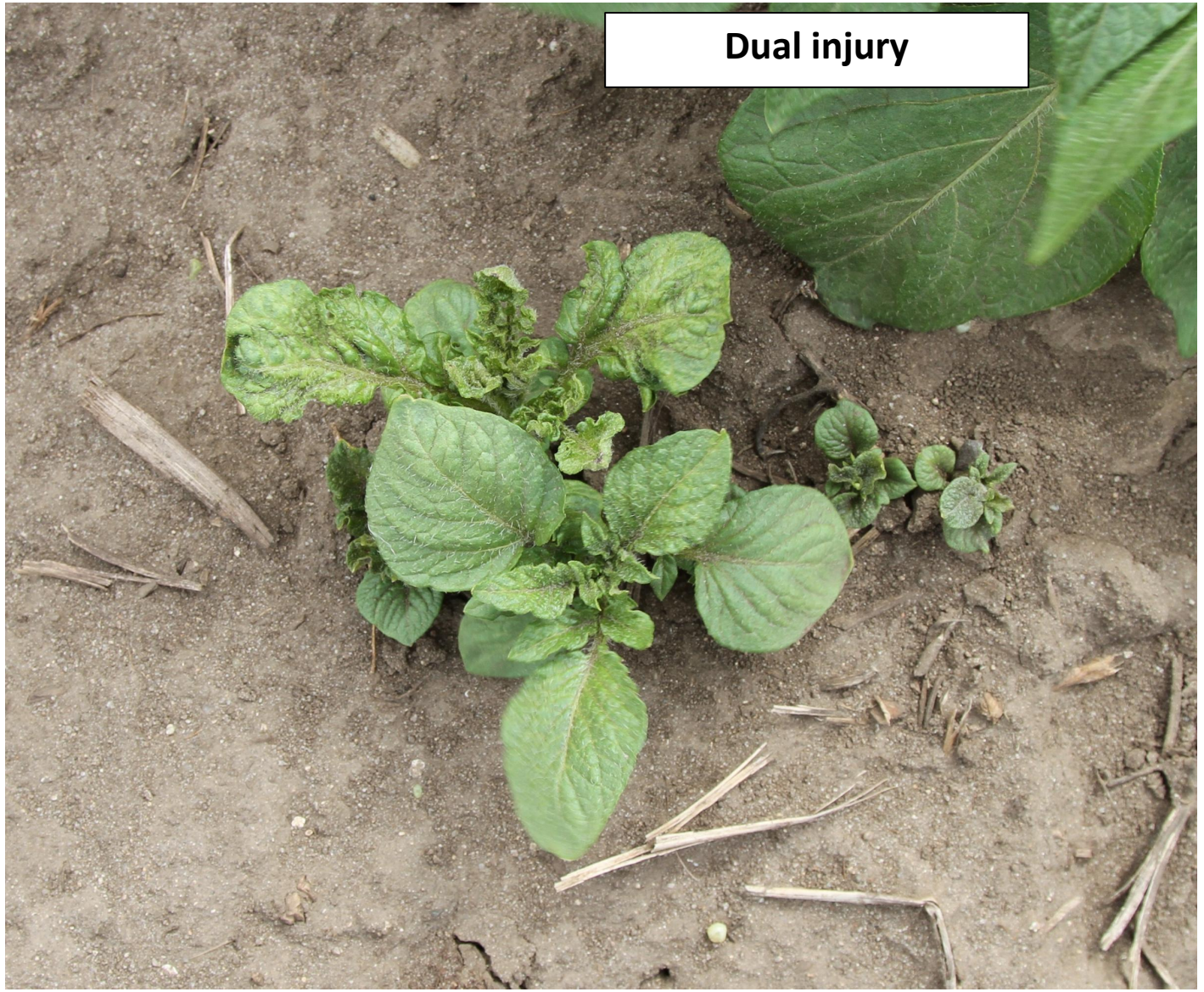
- More active in soils with:
  1. pH > 7.5
  2. Low organic matter
  3. Stressed plants
- Foliar: symptoms can be severe within 3 days after periods of cool, wet, or cloudy weather.

Outlook

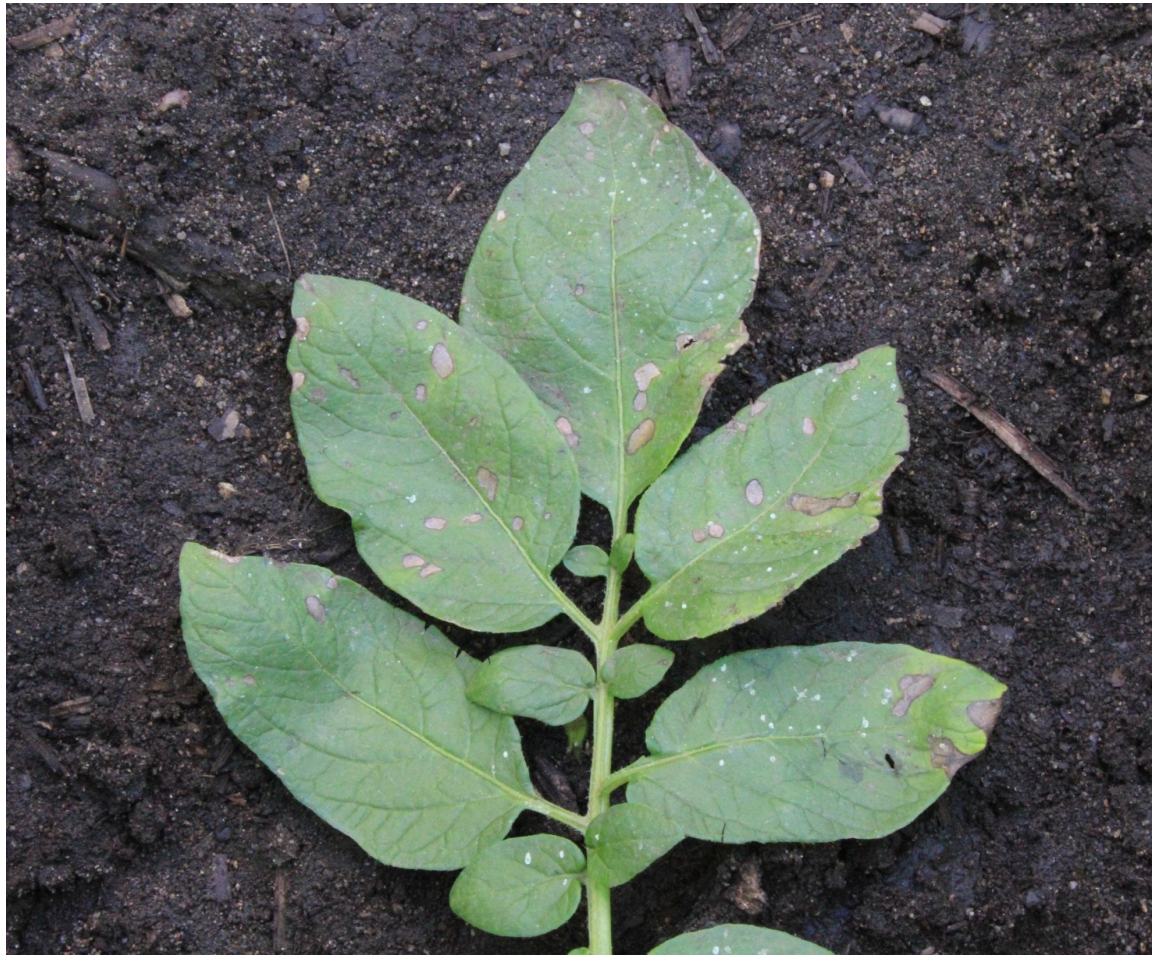
- Inhibit proper cell division
- Very water soluble = quickly available
- Provide good to excellent control of
  - Common lambsquarters
  - Pigweed species
  - Nightshade species

Dual & Outlook injury

- Cold & wet
- Slows metabolism = plant injury
- Delayed row closure
- Potential yield reduction
- Change herbicides?


Dual injury

Late preemergents



What to do when herbicides are late?

What are your options?

- Continue with program
- Switch to plan B
  - Different herbicides
  - Increased tillage
  - Cover potatoes
  - Aggressive postemergence

What to do when herbicides are late?

- Understand chemistry
- What's the potential injury?
- Potential weeds issues?
- Weather conditions
- Risk management

Case study: Linuron + metribuzin timings

Chlorosis at 4 days after emergence treatment

Chlorosis at 8 days after emergence treatment

Non-treated

Linuron 12 oz/a +
Metribuzin 0.67 lb/a 4
WAT preemergence

Linuron 12 oz/a +
Metribuzin 0.67 lb/a 3
WAT emergence

Linuron 12 oz/a +
Metribuzin 0.67 lb/a 1
WAT 8-10 in tall
postemergence

Linuron 24 oz/a +
Metribuzin 0.67 lb/a 4
WAT preemergence

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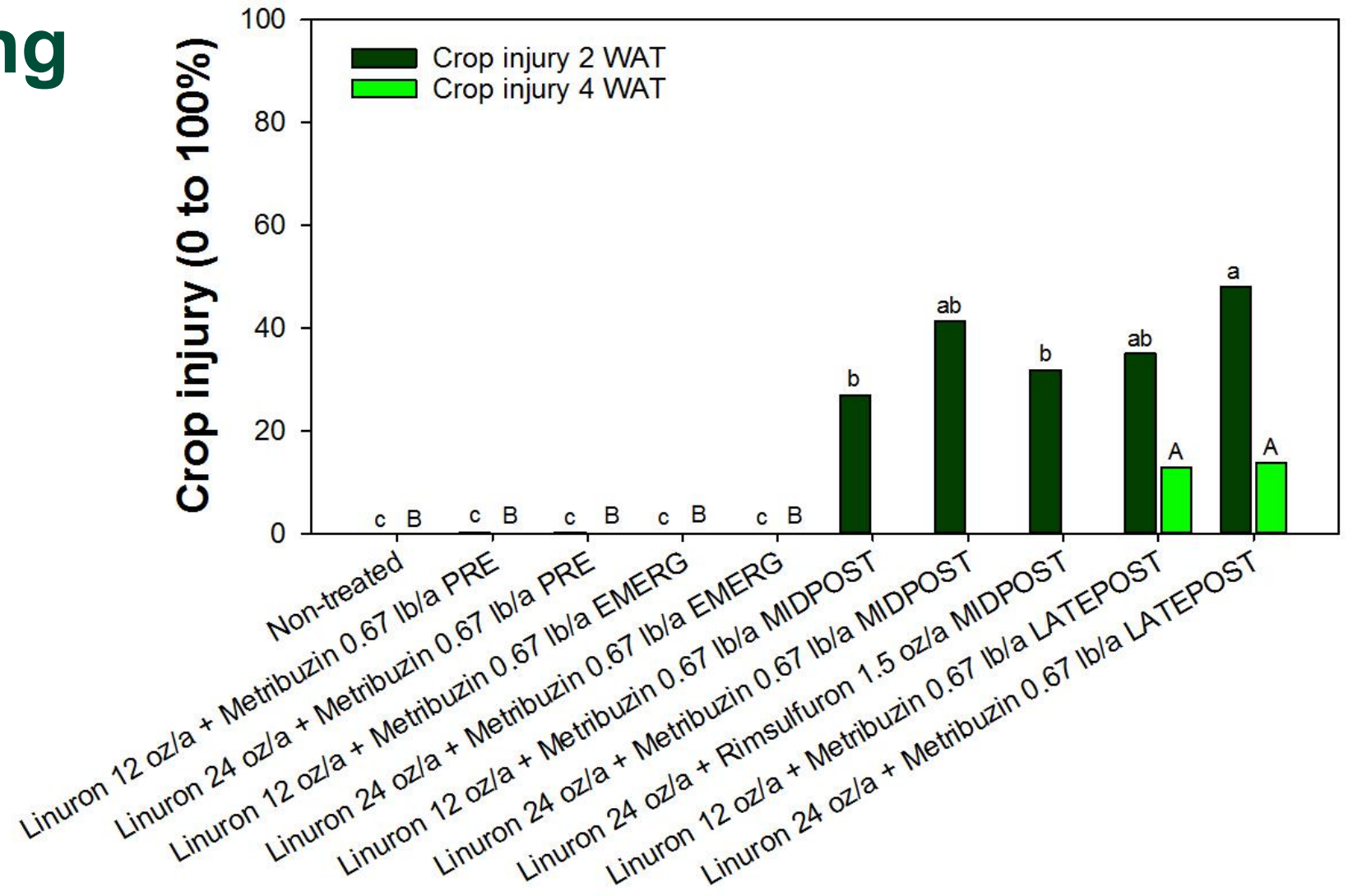
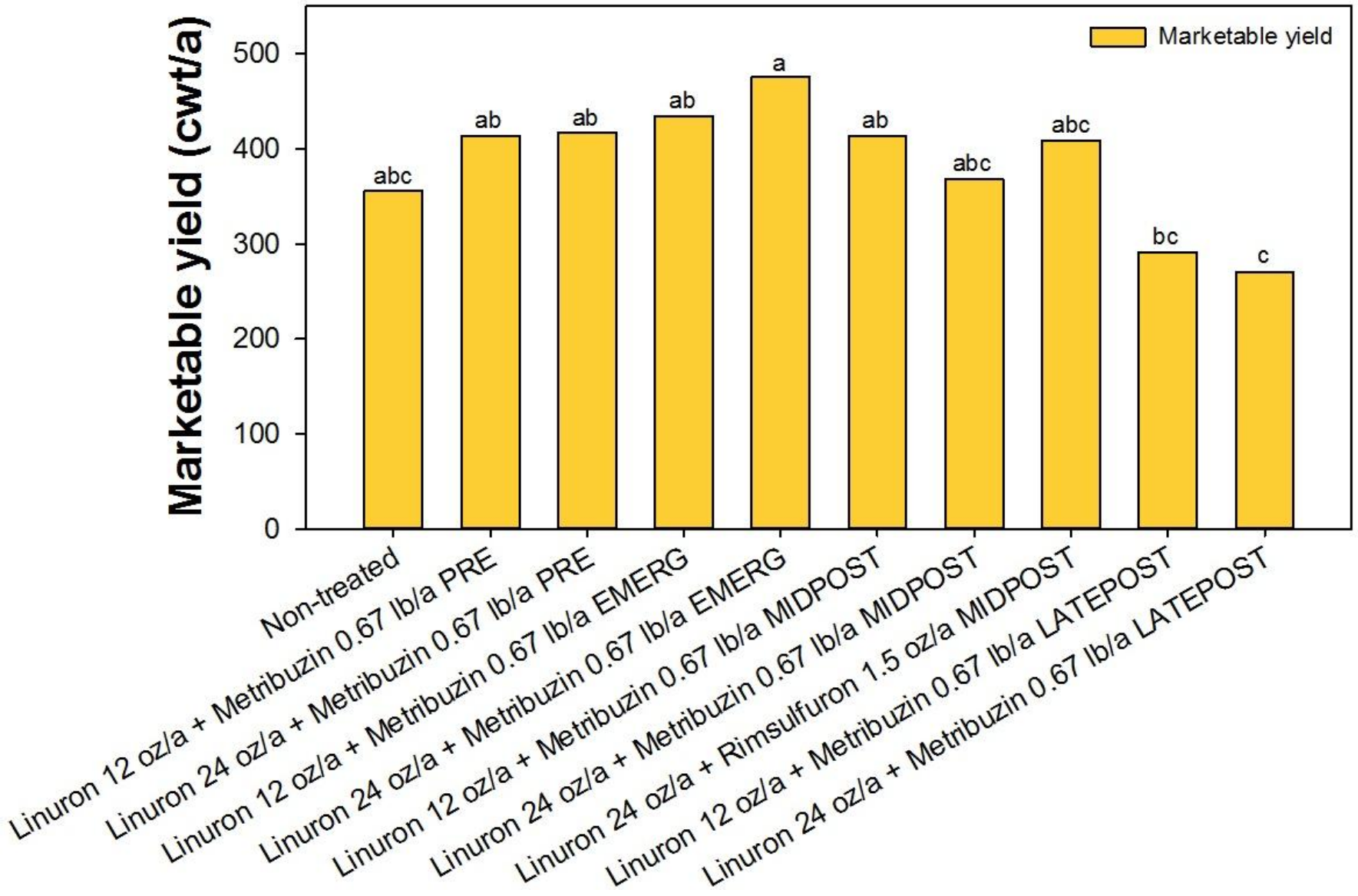
Chlorosis caused by
linuron

Herbicide timing on injury



Yield Results



QUESTIONS?

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