

# Wrangling Weeds Within Potatoes



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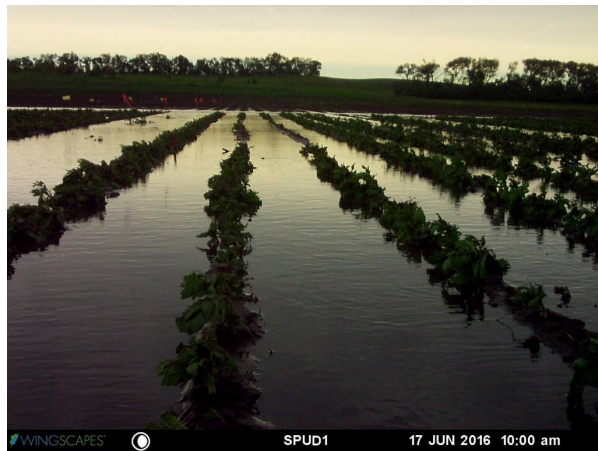
# Weeds

- 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	1960	0.3	164
		ethalfluralin / Sonalan	1974	0.3	34
		pendimethalin / Prowl	1974	0.3	44
Lipid synthesis inhibition	8 / N	EPTC / Eptam	1957	370	9
PS II inhibitors	5 / C1 C2	metribuzin / Metribuzin	1964	1100	21
		linuron / Linex	1962	75	60
PPO inhibitors	14 / E	flumioxazin / Chateau	1989	2	15
		fomesafen / Reflex	1983	50	100
		Sulfentrazone	1998	780	211
Inhibition of VLCFAs	15 / K3	dimethenamid / Outlook	1993	1174	20
		metolachlor / Dual	1972	488	40
		Pyroxasulfone / Zidua	2019	3.5	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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<b>Lipid synthesis inhibition</b>	<b>8 / N</b>	<b>EPTC / Eptam**</b>
** 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?









# 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

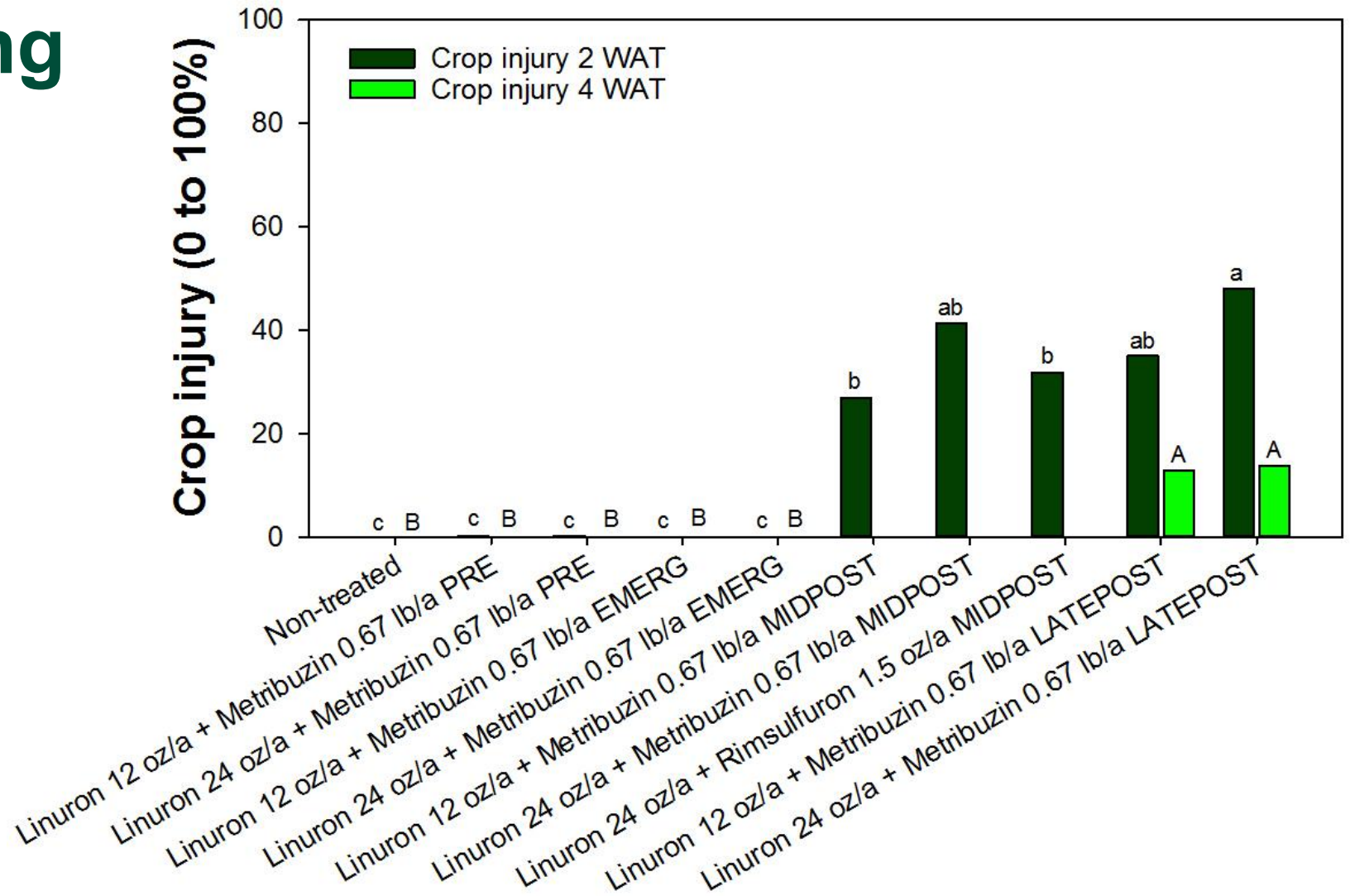
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Chlorosis caused by  
linuron

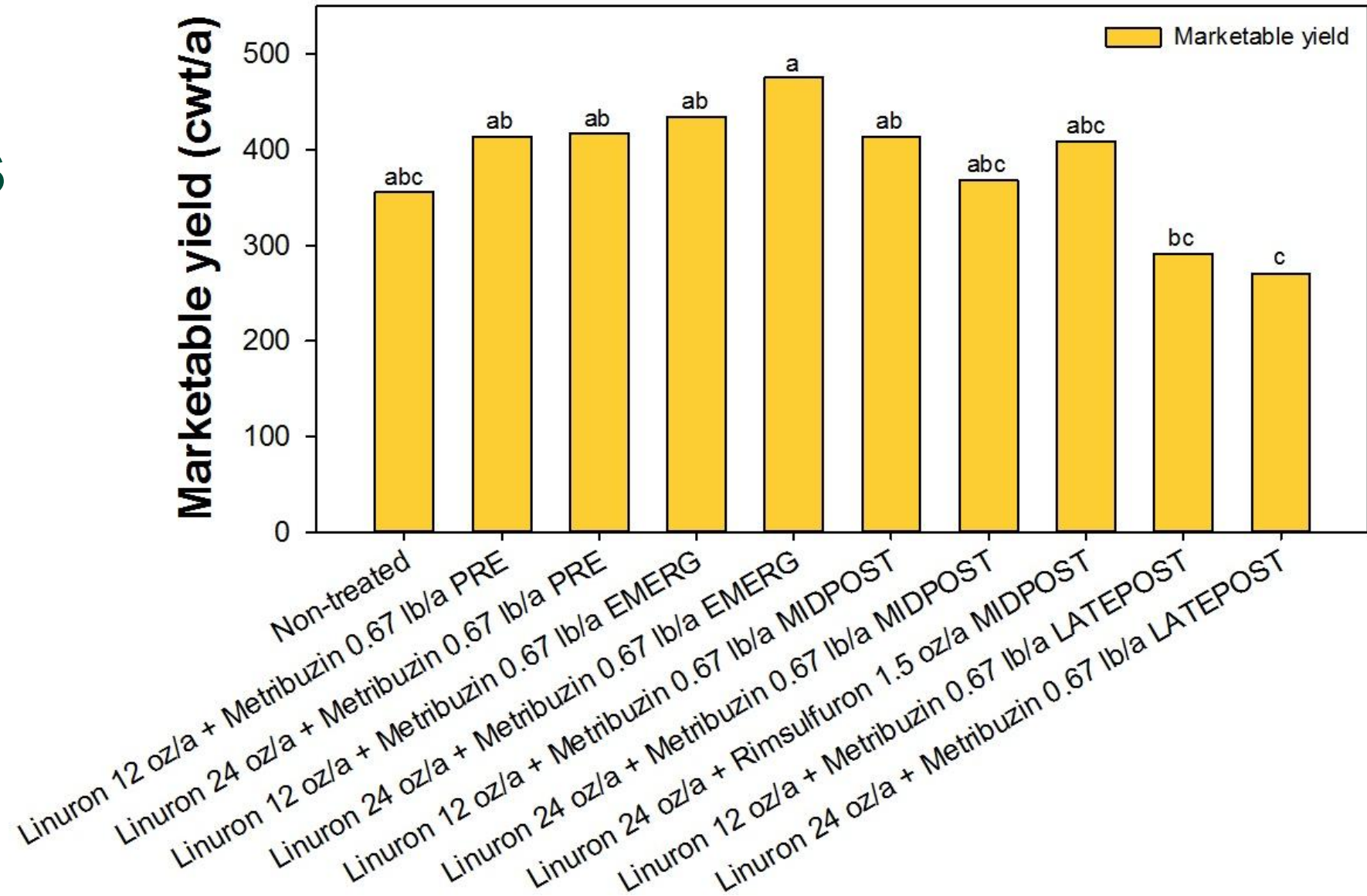


# Herbicide timing on injury





# Yield Results





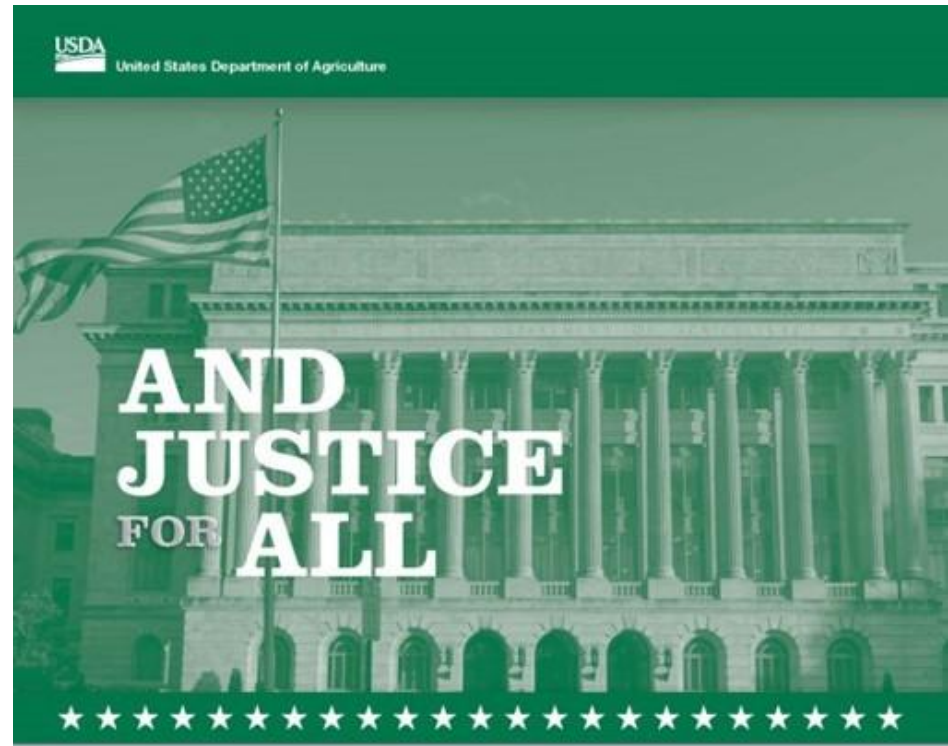
**QUESTIONS?**





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