54 Potato

Where: Grand Gallery Room D
MI Recertification Credits: 2 (1B, COMM CORE, PRIV CORE)
CCA Credits: PM (2)
Moderator: Fred Springborn, Michigan State University

2:00 PM **Potential for Drones in Remote Scouting of Potato**
- Ian McRae, University of Minnesota

2:30 PM **Weed Management and Vine Desiccation Update**
- Jed Colquhoun, University of Wisconsin

3:00 PM **Potato Pathology Update**
- Jamie Willbur, Michigan State University

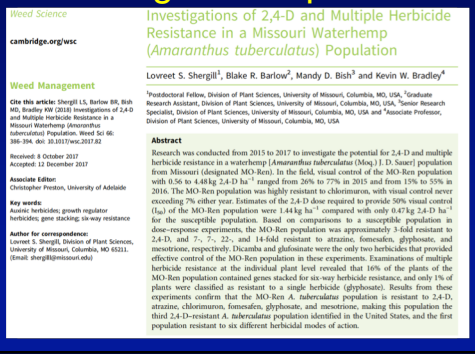
3:30 PM **Management of Root Lesion Nematode and Verticillium Wilt**
- Marisol Quintanilla-Tornel

4:00 PM **Session Ends**

Potato vine and weed management

- Potential new herbicides for potato
- Alternative vine management strategies
- Predicting herbicide carryover in seed when you can't see it…

We need new weed management options!



Weed Science

cambridge.org/wsc

Weed Management

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Investigations of 2,4-D and Multiple Herbicide Resistance in a Missouri Waterhemp (*Amaranthus tuberculatus*) Population

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Abstract

Research was conducted from 2015 to 2017 to investigate the potential for 2,4-D and multiple herbicide resistance in a waterhemp [*Amaranthus tuberculatus* (Moq.) J. D. Sauer] population from Missouri (designated MO-Ren). In the field, visual control of the MO-Ren population with 0.56 to 4.48 kg 2,4-D ha^{-1} ranged from 26% to 77% in 2015 and from 15% to 55% in 2016. The MO-Ren population was highly resistant to chlorimuron, with visual control never exceeding 7% either year. Estimates of the 2,4-D dose required to provide 50% visual control (I_{50}) of the MO-Ren population were 1.44 kg ha^{-1} compared with only 0.47 kg 2,4-D ha^{-1} for the susceptible population. Based on comparisons to a susceptible population in dose–response experiments, the MO-Ren population was approximately 3-fold resistant to 2,4-D, and 7-, 7-, 22-, and 14-fold resistant to atrazine, fomesafen, glyphosate, and mesotrione, respectively. Dicamba and glufosinate were the only two herbicides that provided effective control of the MO-Ren population in these experiments. Examinations of multiple herbicide resistance at the individual plant level revealed that 16% of the plants of the MO-Ren population contained genes stacked for six-way herbicide resistance, and only 1% of plants were classified as resistant to a single herbicide (glyphosate). Results from these experiments confirm that the MO-Ren *A. tuberculatus* population is resistant to 2,4-D, atrazine, chlorimuron, fomesafen, glyphosate, and mesotrione, making this population the third 2,4-D–resistant *A. tuberculatus* population identified in the United States, and the first population resistant to six different herbicidal modes of action.

Potential new potato herbicides

- League: recently labeled for PRE and POST use
- Sonalan: working with registrant to expand regional registration to include Midwest US
- Zidua: tolerance established by EPA in May 2018, awaiting addition to commercial label

Sonalan and Zidua are not currently registered for use on Midwest US potato

Potential new potato herbicides

- Other potential herbicides showing good crop tolerance and broad-spectrum weed control in refined research:
  - Bicyclopyrone
  - Firstrate
  - Callisto
  - Basagran
  - Sandea
  - Caparol

These are not currently registered for use on potato

League herbicide

- Active ingredient: imazosulfuron
- Registrant: Valent
- ALS inhibitor with PRE and early POST activity
- Rotational restrictions can be lengthy: up to 24 months for some crops

- Melon: row middle application
- Pepper: row middle and directed spray
- Tomato: pre-transplant, over-the-top, directed spray
- Potato: PRE or POST

League

- Weed control strength:
  - Yellow nutsedge
  - In general, better PRE than POST
- Weed control weakness:
  - Nightshades

League

Zidua

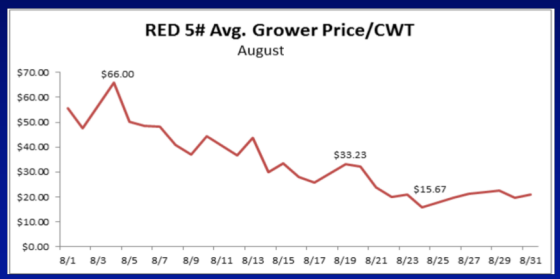
- Tolerance established, waiting on commercial label addition
- Hill-spray
- Sand, silt loam, and muck

* Not currently registered in potato *

Potato vine desiccation: Diquat in registration review

- Diquat undergoing normal EPA registration review required of all pesticides every 15 years
- Initial EPA review: use timing, number of applications and rate restrictions may be needed
- Open comment period: input from researchers and industry emphasized importance in potato desiccation
- Final EPA decision is overdue…

Fresh-market potatoes: the race for first-to-market



Stopping a well-fertilized freight train

Source: Rebrn.com

'Yukon gold' leaf and stem management

Treatment	Timing	% Leaf		% Stem	
		8 d	0 d	8 d	0 d
Non-treated	--	22	77	8	37
Diquat + diquat	21 + 14 d	100	100	100	100
Flail chop	14	100	100	74	100
Roller crimper	14	61	94	31	76
Mowing + diquat	14 + 8	65	100	34	86
Mowing + diquat + diquat	21 + 14 + 8	100	100	85	100
Flail chop + diquat	14 + 8	100	100	70	100
Flail chop + diquat + diquat	21 + 14 + 8	100	100	100	100
Flame burn + diquat	14 + 8	94	100	90	100
Flame burn + diquat + diquat	21 + 14 + 8	100	100	98	100
Flail chop + flame burn	21 + 14	100	100	100	100

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Flame burn + diquat	14 + 8	94	100	90	100
Flame burn + diquat + diquat	21 + 14 + 8	100	100	98	100
Flail chop + flame burn	21 + 14	100	100	100	100

Roller crimper not effective alone

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Flail chop + flame burn	21 + 14	100	100	100	100

Flail chop + flame burn similar to diquat twice – organic option?

'Yukon gold' skinning and "sticky stolons"

Treatment	Timing	% Skinning		# Stolons/50	
		Harvest	21 d post	Harvest	21 d post
Non-treated	--	8.8	13.9	6	3
Diquat + diquat	21 + 14 d	2.6	3.4	13	6
Flail chop	14	4.3	5.6	12	6
Roller crimper	14	7.7	7.6	9	4
Mowing + diquat	14 + 8	6.3	9.2	9	6
Mowing + diquat + diquat	21 + 14 + 8	3.4	7.4	13	7
Flail chop + diquat	14 + 8	4.5	6.9	10	7
Flail chop + diquat + diquat	21 + 14 + 8	3.0	5.9	11	6
Flame burn + diquat	14 + 8	6.2	11.3	7	4
Flame burn + diquat + diquat	21 + 14 + 8	2.5	3.6	13	9
Flail chop + flame burn	21 + 14	2.6	3.7	13	7

Same programs where stem management was poor

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Flame burn + diquat + diquat	21 + 14 + 8	2.5	3.6	13	9
Flail chop + flame burn	21 + 14	2.6	3.7	13	7

Flail chop + flame burn again similar to diquat applied twice

'Yukon gold' yield

Treatment	Timing	Tuber yield (kg ha^{-1})			
			Cull	113-169 g	Total
Non-treated			3,189	16,519	64,564
Diquat + diquat			1,567	16,131	57,942
Flail chop	14	620	2,916	17,406	65,412
Roller crimper	14	670	3,772	12,852	66,939
Mowing + diquat	14 + 8	741	1,998	15,295	61,878
Mowing + diquat + diquat	21 + 14 + 8	686	2,961	15,901	58,185
Flail chop + diquat	14 + 8	432	2,706	16,881	64,890
Flail chop + diquat + diquat	21 + 14 + 8	443	2,796	15,909	56,008
Flame burn + diquat	14 + 8	435	1,747	14,203	62,545
Flame burn + diquat + diquat	21 + 14 + 8	444	2,094	15,065	54,142
Flail chop + flame burn	21 + 14	618	2,554	15,519	57,865

Heavy rain after mechanical management led to tuber greening

'Yukon gold' yield

Treatment	Timing	Tuber yield (kg ha^{-1})			
		B-size	Cull	113-169 g	Total
Non-treated	--	504	2,189	16,519	64,564
Diquat + diquat	21 + 14 d			16,131	57,942
Flail chop	14			17,406	65,412
Roller crimper	14			12,852	66,939
Mowing + diquat	14 + 8	741	1,998	15,295	61,878
Mowing + diquat + diquat	21 + 14 + 8	686	2,961	15,901	58,185
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No differences among programs in desired market target weights

Closing thoughts on vine management

- Timing is critical: if size grade distribution can be anticipated, initiating vine management 21 d prior to harvest is beneficial, regardless of method
- Flail chop or roller crimper alone, at the level of the top of the hills, leaves green plant material between the hills and can lead to tuber greening
- Follow-up grower-level work: mowing the top 1/3 of vines prior to diquat 2x can slow the freight train in vigorous years
- Flail chop followed by flame burn can manage organic potato vines

Implications of off-target herbicides in seed potatoes

Materials and Methods

- 'Russet Burbank' potatoes grown in Hancock, WI
  - Tank-contamination herbicide application at tuber initiation
  - Injury and yield evaluated
  - Seed stored
  - Seed sent to winter grow-out test in HI
- Seed planted in Hancock in following season
  - Injury and yield evaluated

Materials and Methods

Evaluated at 1% of typical use rate, with appropriate adjuvants:

- 2,4-D
- Dicamba
- Aminopyralid
- Glyphosate
  - Also at 2 and 4%

- Fluthiacet-ethyl
- Flumiclorac
- Cloransulam
- Thifensulfuron
- Tribenuron
- Metsulfuron
- Mesotrione
- Tembotrione
- Topramezone

Mesotrione, 5 DAT, 10%

Seed Hancock | Grow-out Hawaii | Ware Hancock

Dicamba, 28 DAT, 16%

Seed Hancock | Grow-out Hawaii | Ware Hancock

Aminopyralid, 28 DAT, 18%

Seed Hancock | Grow-out Hawaii | Ware Hancock

Seed year Potato Yield:

- No differences in tuber yield
- No differences in tuber quality

Seed Hancock | Grow-out Hawaii | Ware Hancock

Seed Hancock | Grow-out Hawaii | Ware Hancock

Seed Hancock | Grow-out Hawaii | Ware Hancock

Ware Year Injury:

- Transient
- Subtle
- Affecting individual plants
- Statistically similar, but generally greatest with herbicides that also caused in injury in seed year
  - Addition: thifensulfuron

Seed Hancock → Grow-out Hawaii → Ware Hancock

Aminopyralid, year after exposure

Seed Hancock → Grow-out Hawaii → Ware Hancock

Ware Year Yield:

- Total yield, B's and culls did not differ among treatments
- 10-13 ounce tubers were reduced by dicamba, cloransulam and tribenuron

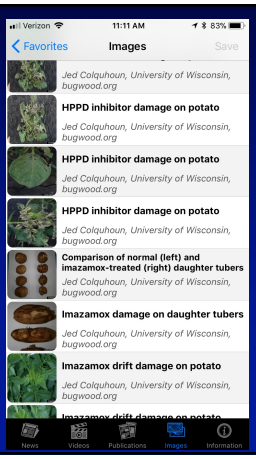
Seed Hancock → Grow-out Hawaii → Ware Hancock

Summary

Seed Year Injury	Seed Year Yield	Ware Year Injury	Ware Year Yield (10-13 oz)
Dicamba	No yield or quality affects	Dicamba	Dicamba
Aminopyralid		Aminopyralid	Cloransulam
Mesotrione		Mesotrione	Tribenuron
		Thifensulfuron	

FAQs

- Can you test seed for herbicides?
  - Yes, for most herbicides if you know what you are looking for (Exception: synthetic auxins)
- If you test and find an herbicide, does that mean that the seed will have issues?
  - It depends: herbicide, application timing, metabolism after exposure, plant stress, growing conditions, etc.
  - No clear relationship between ppm and risk – can just confirm seed exposure
  - Absence of evidence isn't evidence of absence



Curious about potato symptomology?

IPM ToolKit App:
-Free on Android or iOS
-Go to "images"
-Click on the search box
-Click on "collection"
-Enter "87770"
-Save