Herbicide Resistance in Ohio Waterhemp Populations

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Waterhemp has now evolved resistance to herbicides from 7 site-of-action families, and multiple resistance is the norm

Resistance in waterhemp – site of action groups

Group 2 – ALS inhibitors – chlorimuron, imazethapyr, etc

Group 4 – Synthetic auxins – 2,4-D, dicamba, etc

Group 5 – Photosystem II inhibitors – atrazine, metribuzin, etc

Group 9 – EPSP synthase inhibitor – glyphosate

Group 14 – PPO inhibitors – fomesafen, flumioxazin, sulfentrazone, etc

Group 15 – long chain fatty acid inhibitors – metolachlor, pyroxasulfone, etc

Group 27 – HPPD inhibitors – mesotrione, isoxaflutole, topramezone, etc

Herbicide resistance in Ohio waterhemp

- % of populations with at least some degree of resistance

- 2016 – 18 populations
  - site 2 – 100% (assumed); site 9 – 100%; site 14 – 28%
  - 28% resistant to glyphosate/ALS/PPO
  - Some with resistance to atrazine (but not metribuzin)

- 2018 - 8 populations
  - site 2 – 100%; site 9 – 87%; site 14 – 25 to 50%
  - Site 2, 9, and 14 – 25 to 50%

- Site 2 = ALS; site 9 = glyphosate; site 14 = PPO

POST Waterhemp screen – 2019 populations – 19 total

	Sensitive >80% dead	Some resistance 50-80% dead	Resistant <50% dead
Atrazine 1.5 lb	53%	31%	16%
Atrazine 6 lb	84%	16%	-
Mesotrione 3 oz	47%	47%	6%
Mesotrione 12 oz	94%	6%	-
2,4-D 1 lb	16%	63%	21%
2,4-D 4 lb	94%	6%	-
Fomesafen 0.3 lb	42%	42%	16%
Fomesafen 1.2 lb	68%	26%	6%

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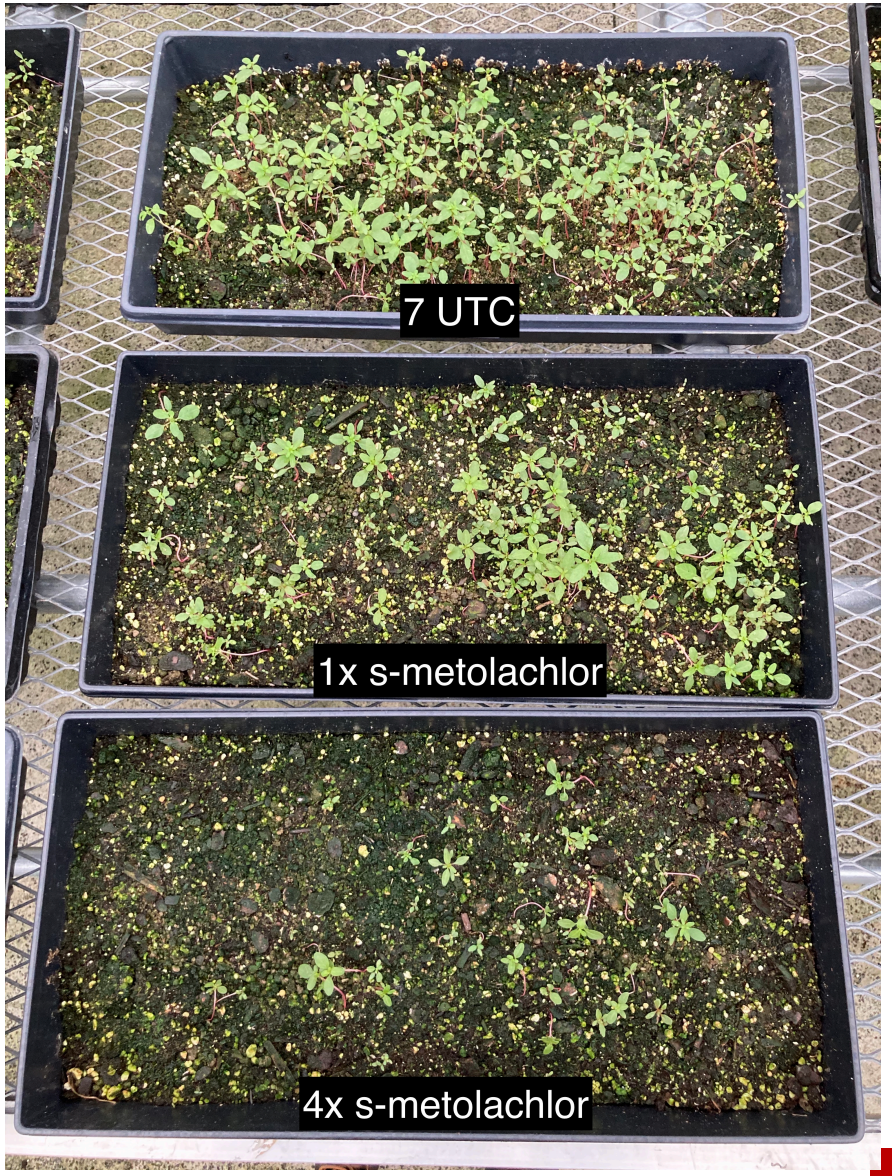
PRE Waterhemp screen – 2019 populations – 19 total

S-metolachlor	>80% control	50-80% control	<50% control
14 days			
1.5 lb ai	6%	84%	10%
6 lb ai	63%	37%	-
28 days			
1.5 lb	-	84%	16%
6 lb	68%	32%	-

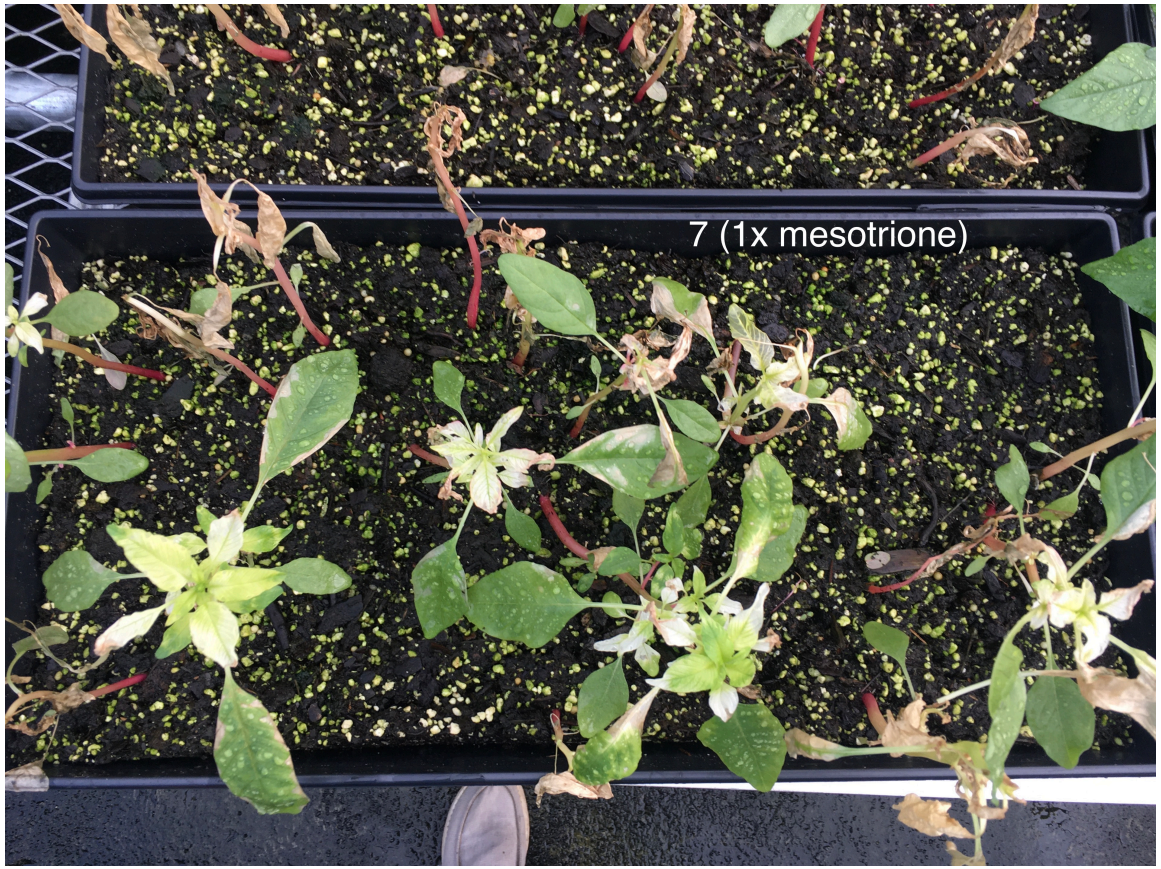
Waterhemp – s-metolachlor – 28 days

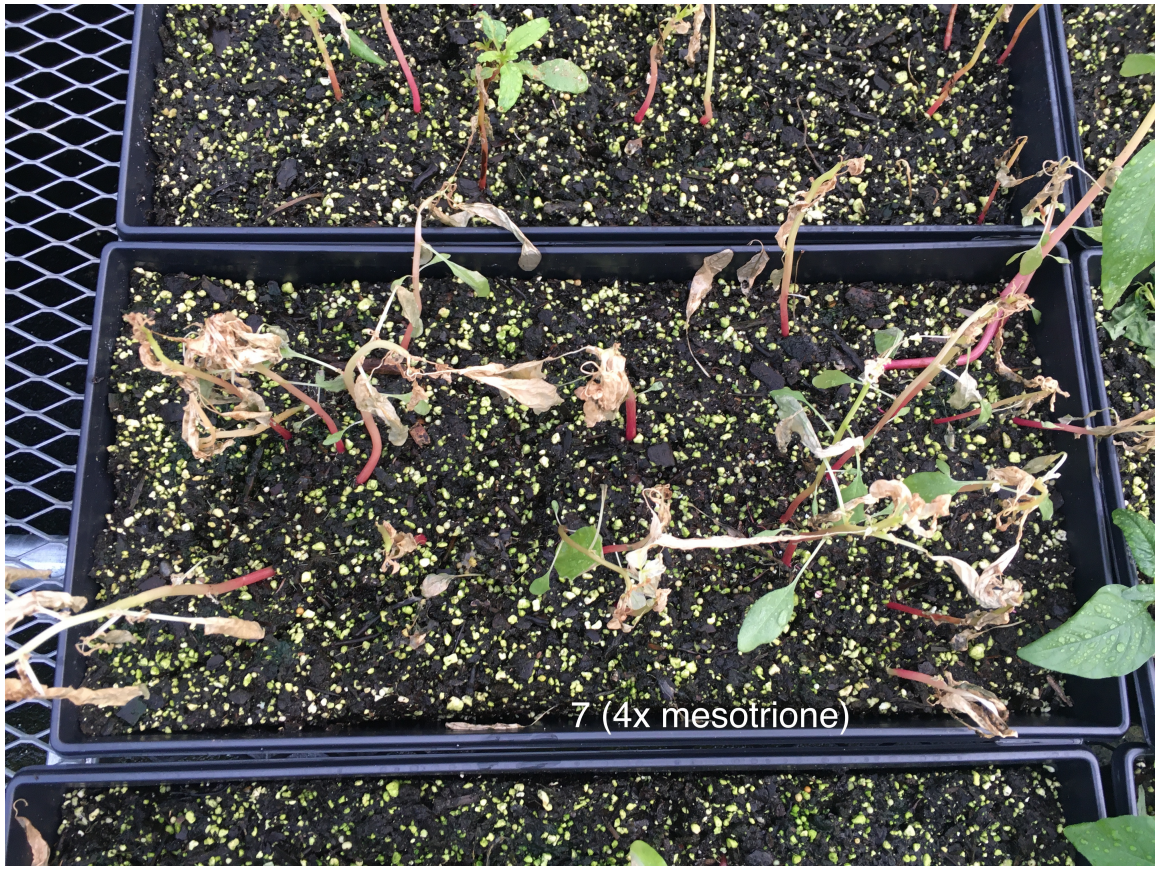


A tale of two waterhemp populations from Darke County

	Population 2		Population 7	
	% mortality			
	1X	4X	1X	4X
Atrazine	95	100	52	86
Mesotrione	100	100	60	96
2,4-D	100	100	55	95
Fomesafen	96	100	50	77
	% control			
S-metolachlor	80	99	20	60

Waterhemp pop #7 – mesotrione – 14 days





1X – 3 oz product

4X – 12 oz product

Waterhemp pop #7 – atrazine – 14 days

1X – 1.5 lb ai

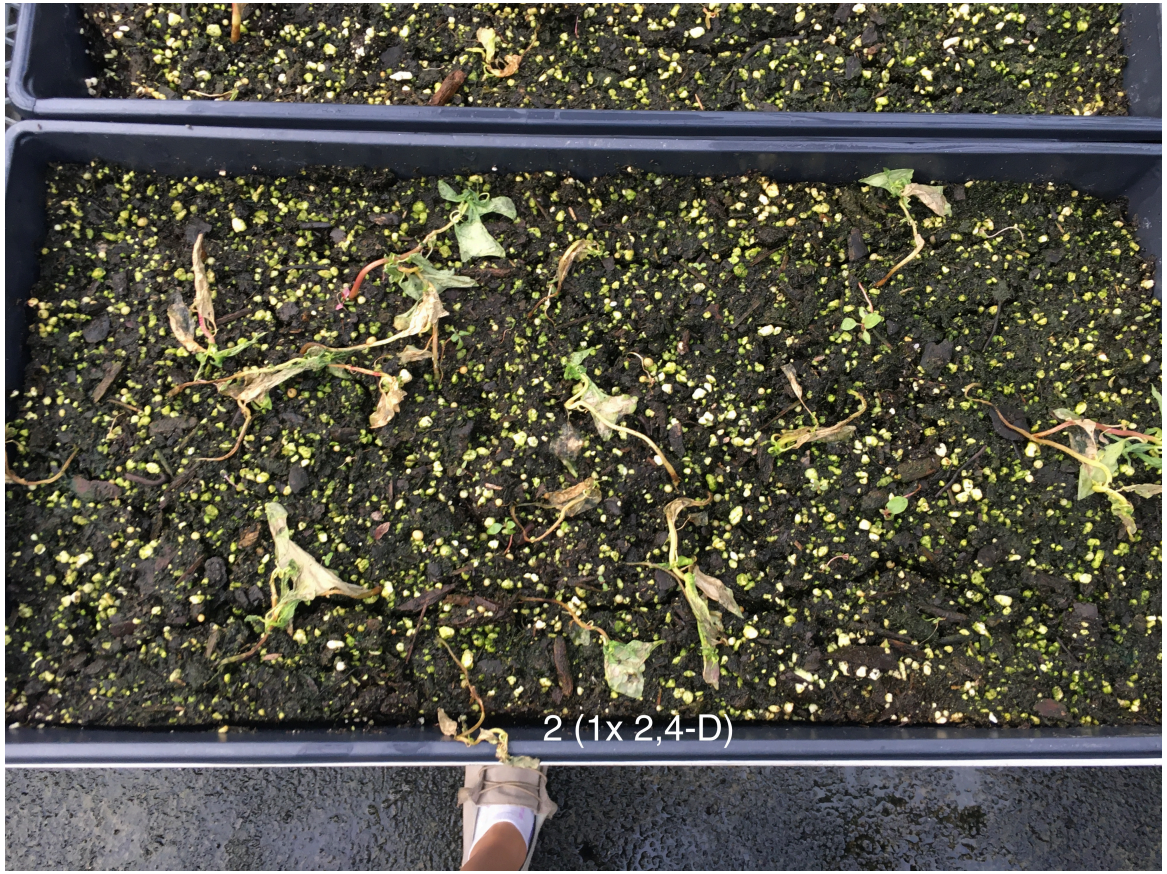
4X – 6 lb ai

Waterhemp pop #7 – 2,4-D amine – 14 days

1X – 1 qt 4L product

4X – 4 qt 4L product

Waterhemp – 2,4-D amine – 14 days



Pop #2 - 1X

Pop #7 – 4X

Ratings of active ingredients on waterhemp
No resistance

- Rating of 8 or 8+
  - flumioxazin
  - metribuzin (>0.38 lb)
  - sulfentrazone
  - pyroxasulfone
  - isoxaflutole (Alite 27)

- Rating of 7 or 7+
  - metolachlor, s-metolachlor
  - dimethenamid
  - pendimethalin
  - acetochlor
  - linuron (Lorox)

Ratings of active ingredients on waterhemp
Resistance to group 14 (PPO)

- Rating of 8 or 8+
  - metribuzin (>0.38 lb)
  - pyroxasulfone
  - isoxaflutole (Alite 27)

- Rating of 7 or 7+
  - metolachlor, s-metolachlor
  - dimethenamid
  - pendimethalin
  - acetochlor
  - linuron (Lorox)
  - flumioxazin
  - sulfentrazone

Ratings of active ingredients on waterhemp
Resistance to group 14 (PPO) and group 15 (acetamides)

- Rating of 8 or 8+
  - metribuzin (>0.38 lb)
  - isoxaflutole (Alite 27)

- Rating of 7 or 7+
  - pendimethalin
  - linuron (Lorox)
  - flumioxazin
  - sulfentrazone

Soybean - can be added to POST for extended control of waterhemp

Use one of these

- pyroxasulfone - most effective
  - Zidua
  - Anthem Maxx, Flex
- metolachlor
  - Dual II Magnum, Parallel, etc
  - Various premixes

Consensus of weeds people - not worth the $$ when used POST

- acetochlor
  - Warrant, Warrant Ultra = acetochlor + fomesafen
- dimethenamid
  - Outlook

POST options for waterhemp control in soybeans
No resistance except site 2 (ALS)

Trait system

- nonGMO – PPO herbicide
- RR – glyphosate, PPO
- LL – glufosinate, PPO
- LL-GT27 – glufosinate, glyphosate, PPO
- Xtend – dicamba, glyphosate
- XtendiFlex – dicamba, glyphosate, glufosinate
- Enlist E3– 2,4-D, glufosinate, glyphosate

POST options for Palmer/waterhemp control in soybeans resistance to site 2 (ALS) and glyphosate

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- nonGMO – PPO herbicide
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POST options for Palmer/waterhemp control in soybeans resistance to sites 2 (ALS), 14 (PPO), and glyphosate

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- nonGMO – PPO herbicide
- RR – glyphosate, PPO
- LL – glufosinate, PPO
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How long until we break glufosinate?

No pigweed left behind

Go Rogue! Stop the seed

The Ohio State University

USB United Soybean Board

Ohio Soybean Council

OSU C.O.R.N. Newsletter

http://corn.osu.edu/

OSU Weed Science Website

http://u.osu.edu/osuweeds

Weed Control Guide for OH/IN

OSU Extension Bulletin 789

OSU Extension estore

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