Vegetable Weed Management - Efficacy & Longevity

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Immokalee

UF IFAS UNIVERSITY of FLORIDA

Horticultural Sciences

Vegetable Weed Management

Efficacy

- Managing emerged weeds effectively

Longevity

- PRE-emergent herbicides for long-term weed control

- Research updates
  - Anh. ammonia as an alternative fumigant

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Weed management in vegetables

‘Weed free’ row middles

Weed managed rows middles

Weed management in vegetables

- Constant supply of moisture and nutrients
- Major challenge is ‘longer-term’ suppression of weeds

Weeds come up quickly in the row middles b/w raised beds

Important strategy to prevent weed outbreak in your farm

Heavy infestation of **Ragweed Parthenium** in row-middles and beds

Heavy infestation of **cutleaf primrose** in row-middles

- Each plant can potentially add **hundreds of thousands of seeds to soil**

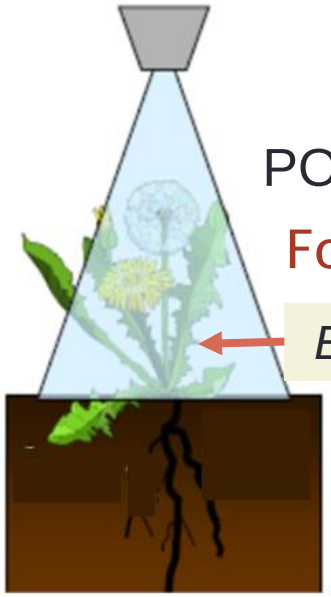
Heavy seed setters

Amaranth / Pigweed

Purslane

Black Nightshade

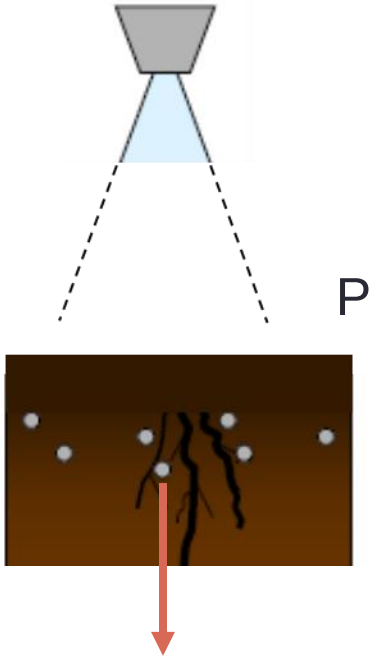
Weed management tool box – chemical control – utilizing herbicides



POST-Emergent

Foliar applied

Emerged weeds



PRE-Emergent

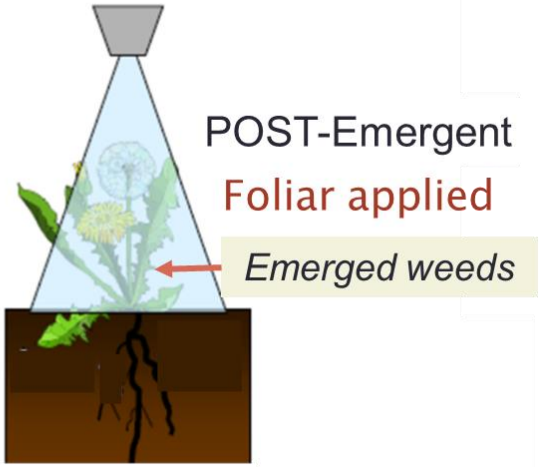
Soil applied

Weed seeds in soil

Major POST-emergent herbicides used in FL vegetables

- **Active ingredient** – Brand name(s)

Non-selective herbicides



Contact

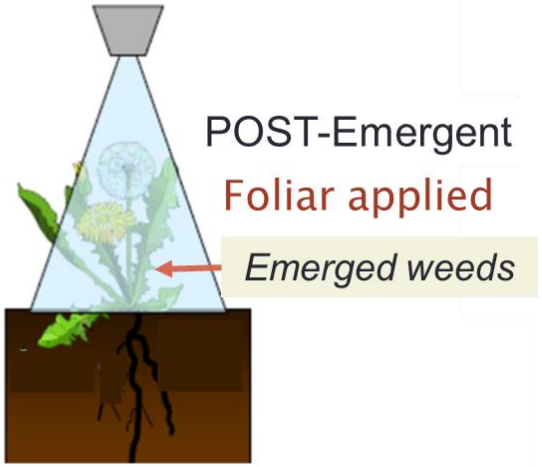
- **Carfentrazone –** Aim EC
- **Paraquat -** Gramoxone

Consult **UF-Vegetable production Guide 2019-20** for crop specific listing and rates of herbicides.

Major POST-emergent herbicides used in FL vegetables

- **Active ingredient** – Brand name(s)

Non-selective herbicides



Contact

- **Carfentrazone –** Aim EC
- **Paraquat -** Gramoxone
- **Diquat -** Reglone
- **Lactofen -** Cobra

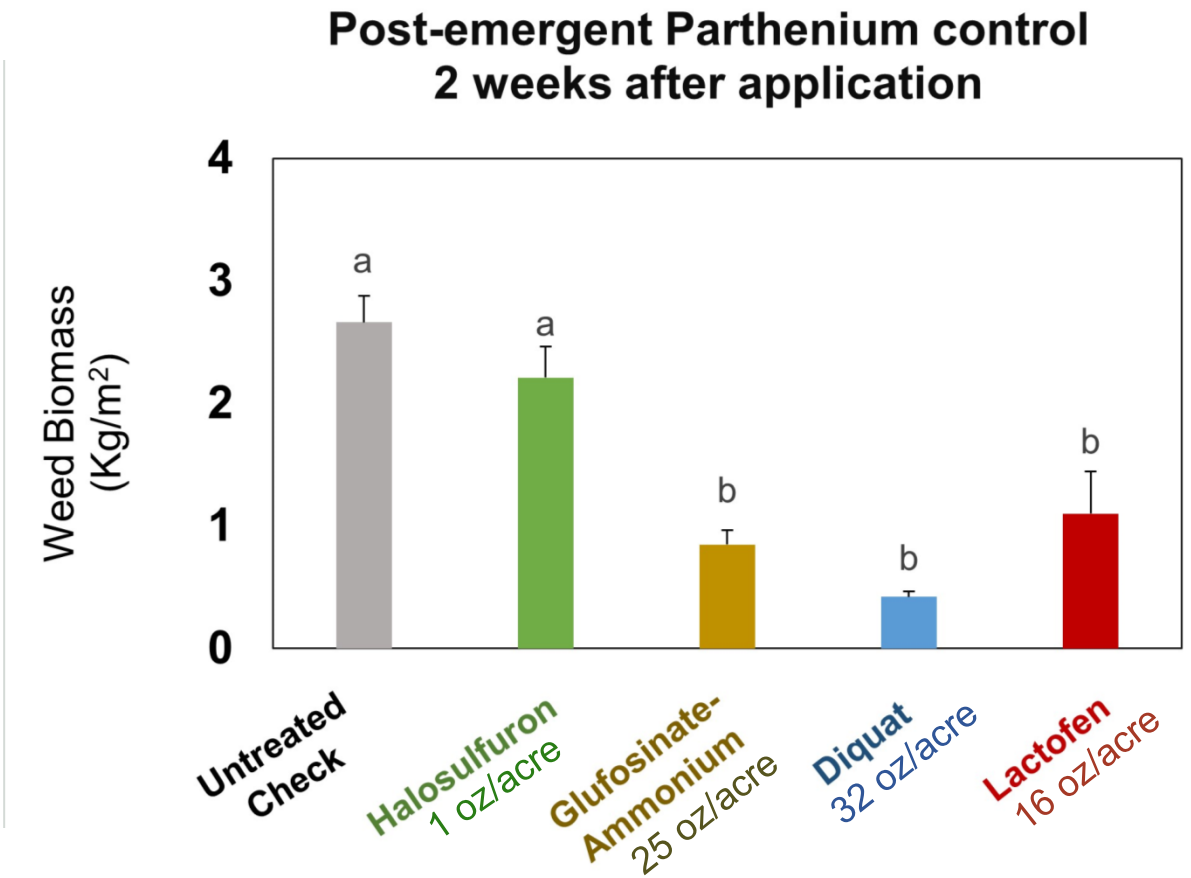
Consult **Vegetable production Guide 2019-20** for crop specific listing and rates of herbicides.

Lactofen and Diquat are effective management option for ragweed parthenium

Heavy seed setters

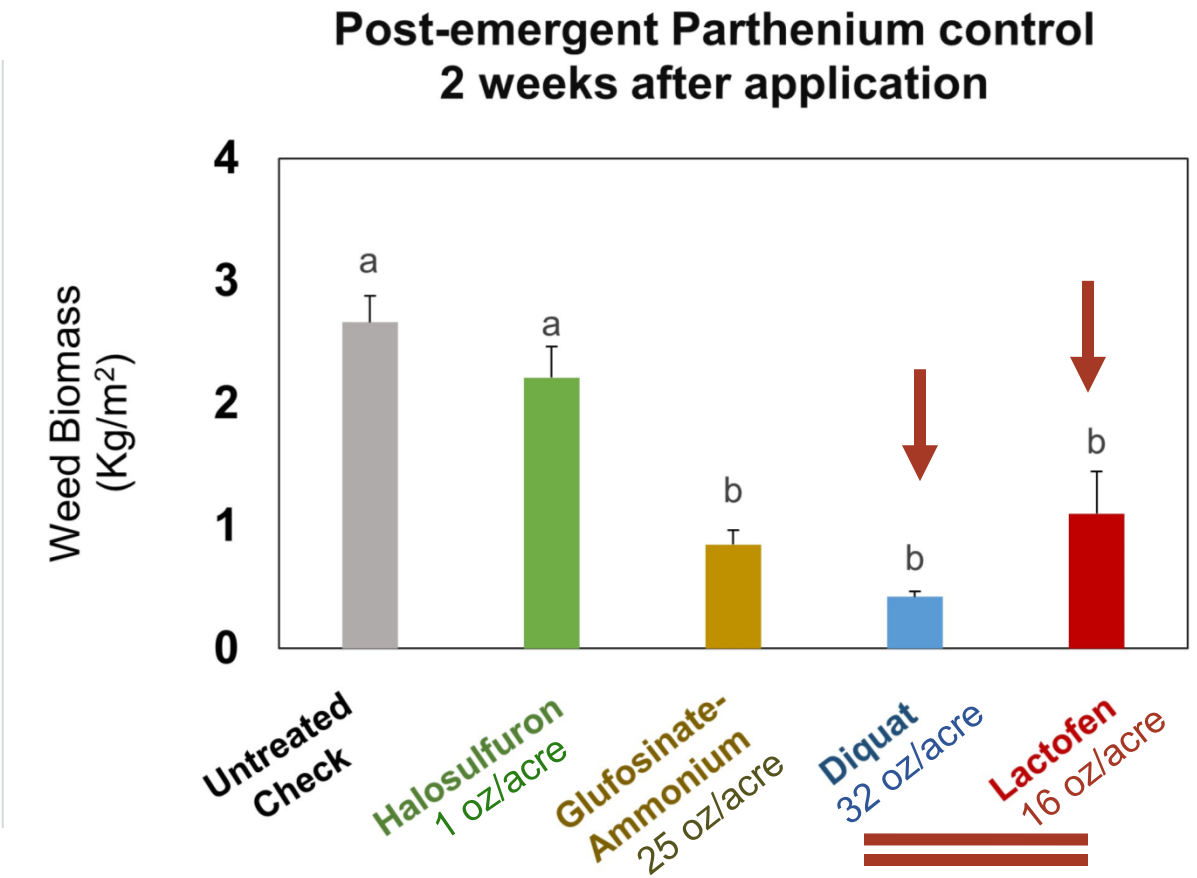
Parthenium

Potential herbicide options studied for effective POST-emergent management of parthenium



- Replication (n) = 5
- Mean comparison: Tukey's hsd (α 0.05)

Potential herbicide options studied for effective POST-emergent management of parthenium



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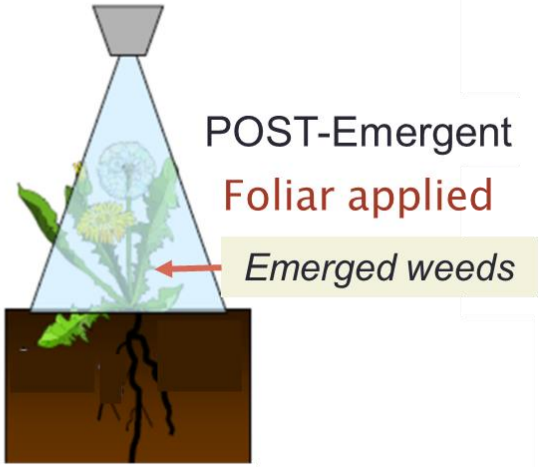


Systemic

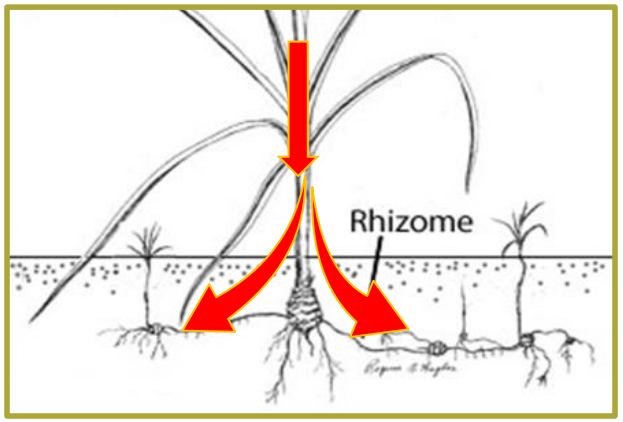
- **Glyphosate –** Roundup, Glystar etc.
- **Halosulfuron –** Sandea

Consult **Vegetable production Guide 2019-20** for crop specific listing and rates of herbicides.

Halosulfuron is an effective management option for perennial weeds like nutsedge

Perennial weeds

Nut sedge



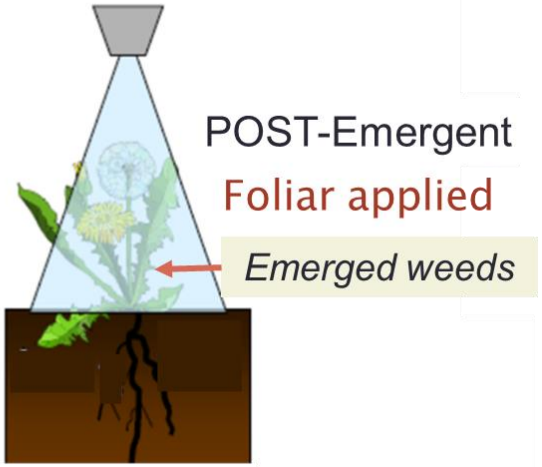
Rhizome & Tubers

- Underground structures

http://ipm.ucanr.edu

Major POST-emergent herbicides used in FL vegetables

Selective herbicides



- **Active ingredient** – Brand name(s)

Grass killers

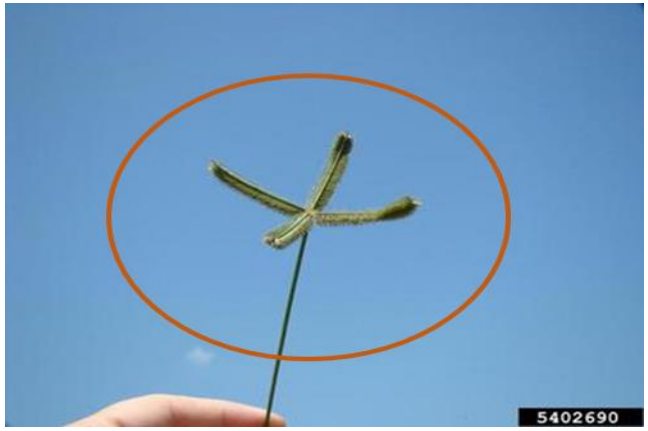
- **Clethodim –** Select, Arrow
- **Sethoxydim –** Poast

Consult **Vegetable production Guide 2019-20** for crop specific listing and rates of herbicides.

Grass weeds

- **Clethodim –** Select, Arrow
- **Sethoxydim –** Poast

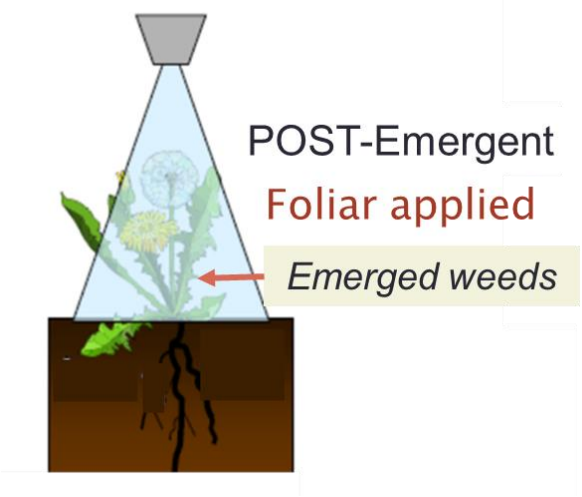
- ACCase inhibitors
- Controls most grasses
- Low or no injury to crops



Crow foot grass

Goose grass in the row middle areas

POST-emergent herbicides



Spray coverage on foliage – key factor

50 gallons or less per acre

Higher spray volumes
- Dense weed infestations
- Large weeds / advanced growth stage

POST- herbicides works best
- when weeds are in early growth stage and active

Spray additives
- Water conditioners
- Surfactants

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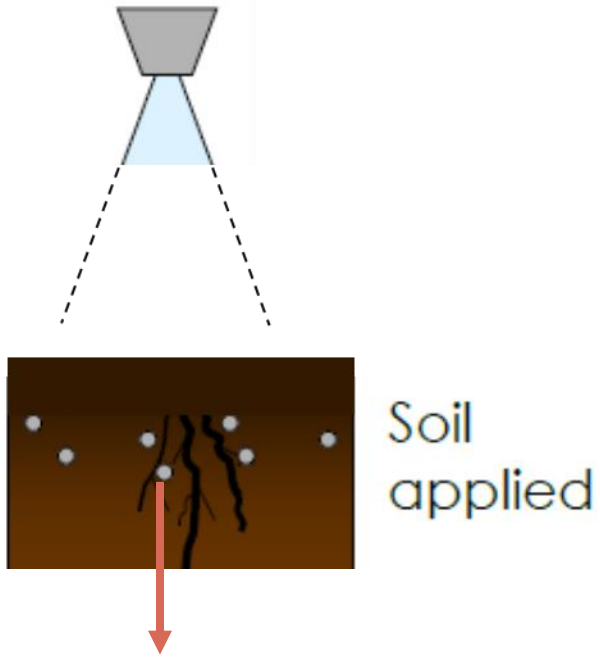
Weed management tool box – chemical control – utilizing herbicides

PRE-emergent OR Residual herbicides



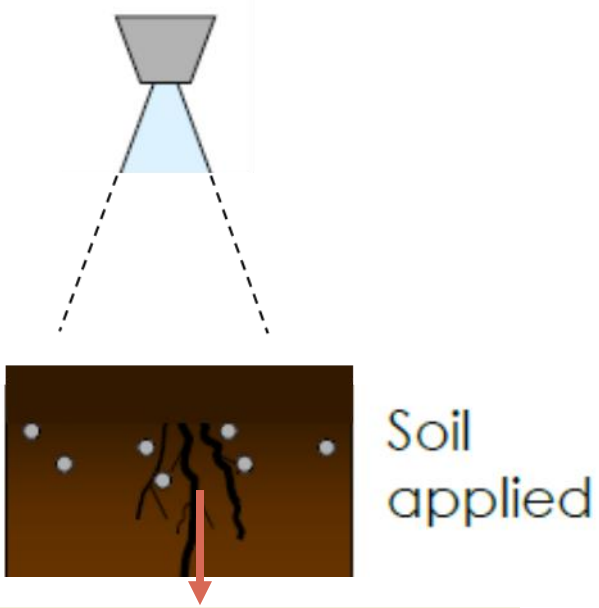
Suppress weed seeds in soil

Prevent seed germination

- Applied to bare soil or minimum ‘existent weed coverage’ to ensure max soil incorporation.
- Rainfall or irrigation will help activate them in soil.

Major PRE-emergent herbicides used in FL vegetables

PRE-emergent OR Residual herbicides



Suppress weed seeds in soil

Active Ingredient	*Product(s)*
Flumioxazin	**Chateau**
S-metolachlor	**Dual Magnum**
Pendimethalin	**Prowl H_2O**
Metribuzin	**Metribuzin, Sencor**
Sulfentrazone	**Spartan**
Rimsulfuron	**Matrix**
Trifluralin	**Trifluralin, Treflan**

Consult **Vegetable production Guide 2019-20** for crop specific listing and rates of herbicides.

Row-middle weed suppression using PRE-emergent herbicides

Active Ingredient(s)	*Products*	*Product Rate (per acre)*
Flumioxazin	Chateau	4.0 oz.
S-metolachlor	Dual Magnum	1.0 pt.
Pendimethalin	Prowl H_2O	1.25 pt.
Metribuzin	Metribuzin	0.50 lbs.
Sulfentrazone	Spartan	4.125 oz.
Rimsulfuron	Matrix	1.5 oz.
Trifluralin	Trifluralin HF	1.0 pt.
Untreated Check	--	--

Study location: Immokalee

Spring 2019

Row-middle herbicide study

1 Month

Active Ingredient(s)	*Products*	*Product Rate (per acre)*
Flumioxazin	Chateau	4.0 oz.
S-metolachlor	Dual Magnum	1.0 pt.
Pendimethalin	Prowl H_2O	1.25 pt.
Metribuzin	Metribuzin	0.50 lbs.
Sulfentrazone	Spartan	4.125 oz.
Rimsulfuron	Matrix	1.5 oz.
Trifluralin	Trifluralin HF	1.0 pt.
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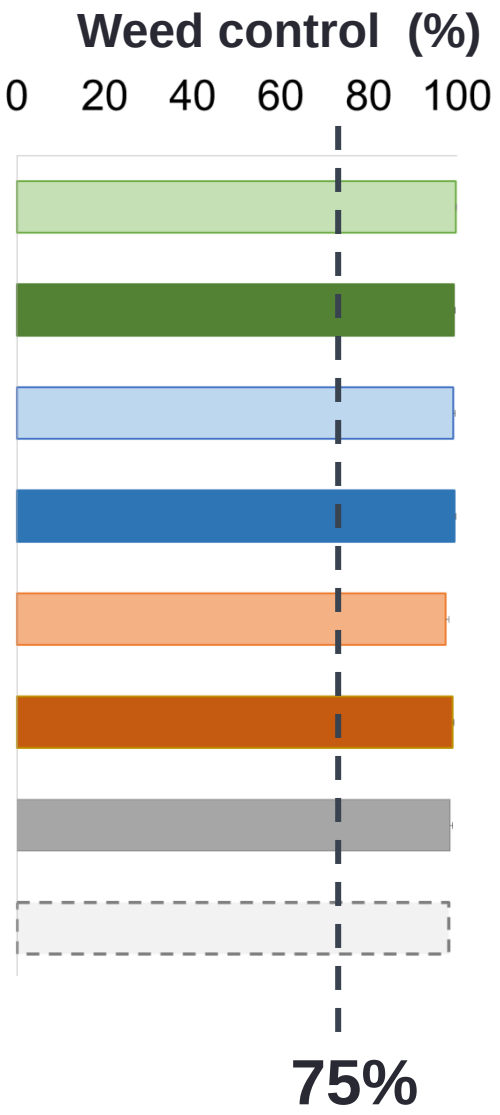

- Replication (n) = 4
- Error bars: Standard Error

Row-middle herbicide study

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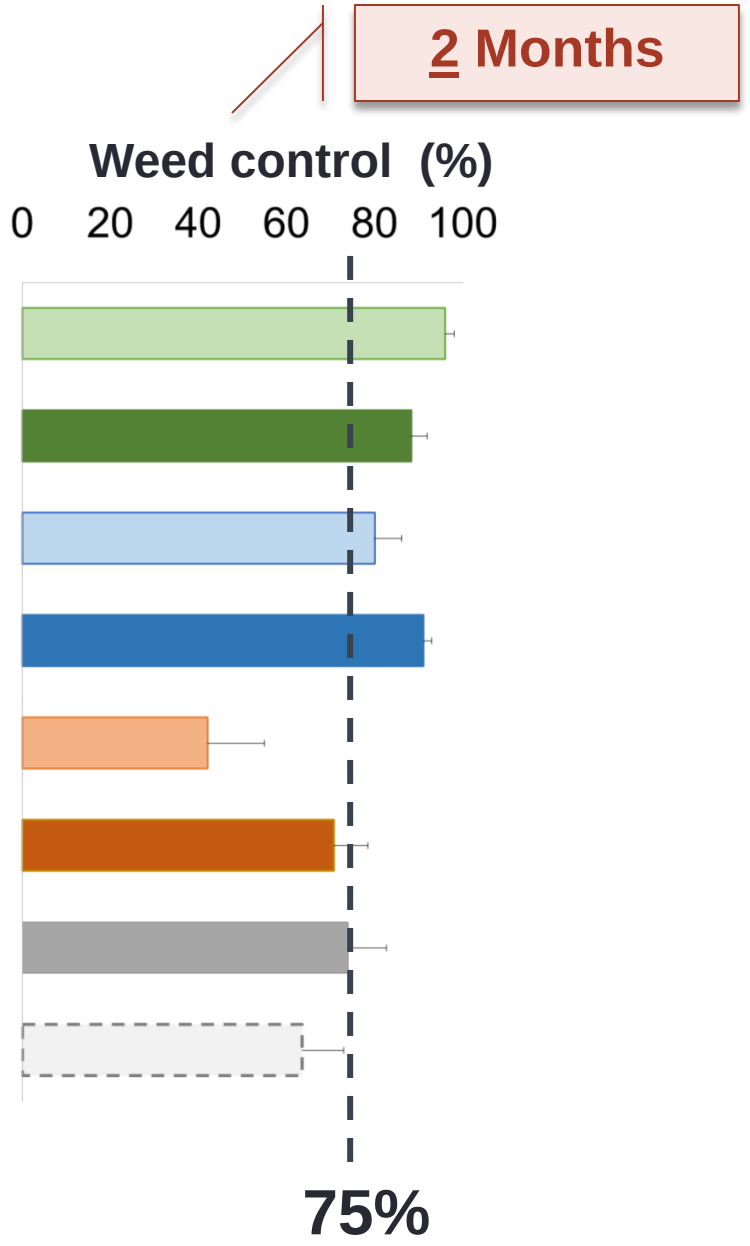

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Row-middle herbicide study

3 Months

Active Ingredient(s)	*Products*	*Product Rate (per acre)*
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S-metolachlor	Dual Magnum	1.0 pt.
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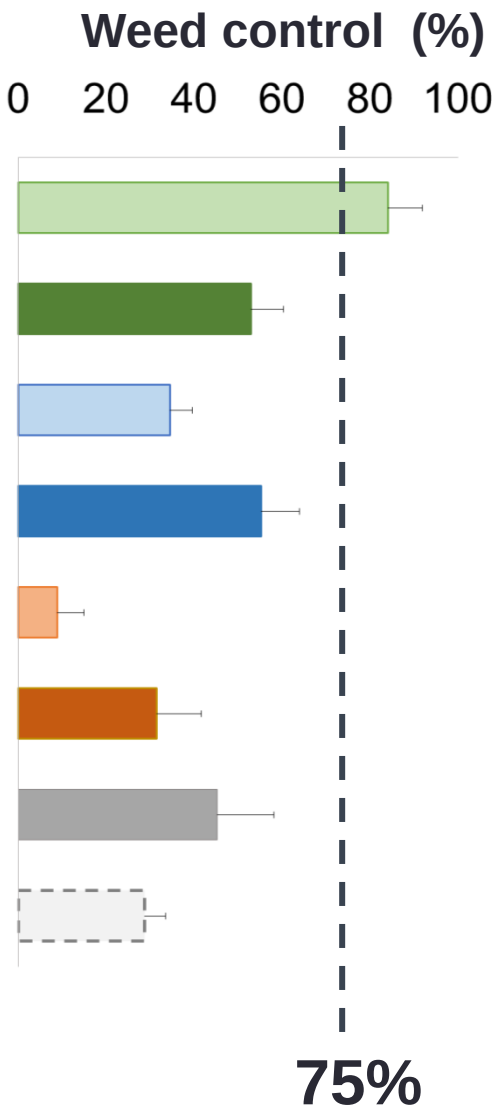

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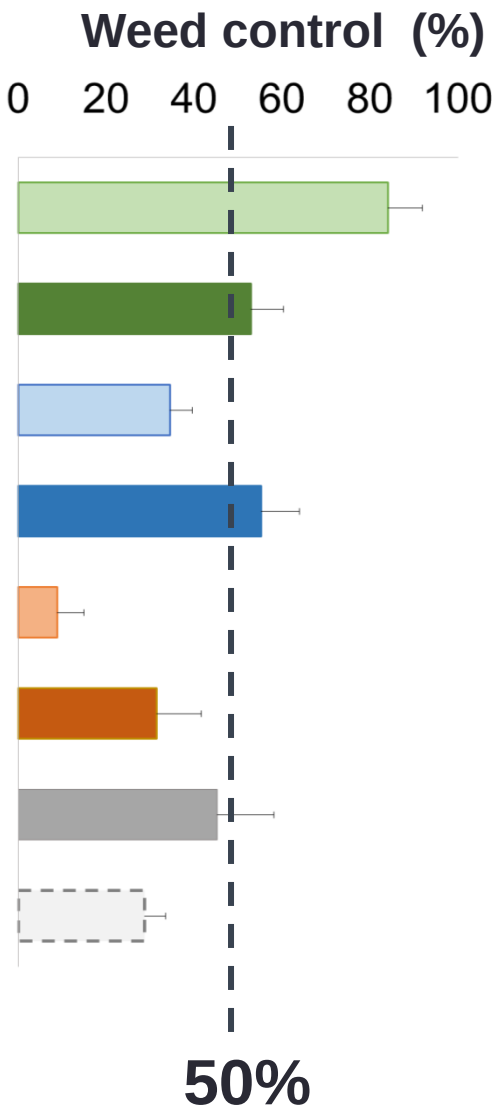

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Row-middle herbicide study

4+ Months

Active Ingredient(s)	*Products*	*Product Rate (per acre)*
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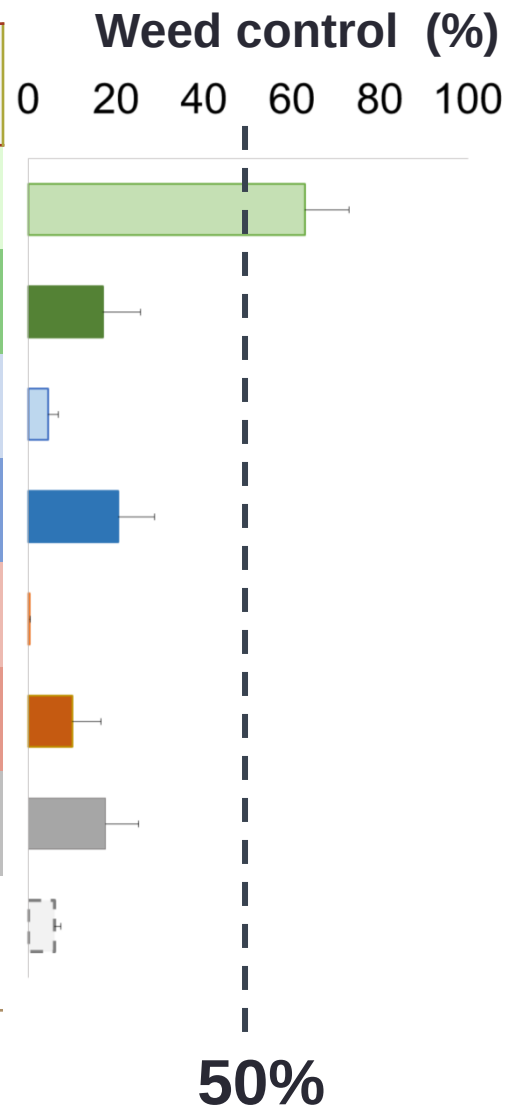
S-metolachlor	Dual Magnum	1.0 pt.
Pendimethalin	Prowl H_2O	1.25 pt.
Metribuzin	Metribuzin	0.50 lbs.
Sulfentrazone	Spartan	4.125 oz.
Rimsulfuron	Matrix	1.5 oz.
Trifluralin	Trifluralin HF	1.0 pt.
Untreated Check	--	--



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Row-middle herbicide study

Weeds controlled

Nutsedge
Cyperus sp.

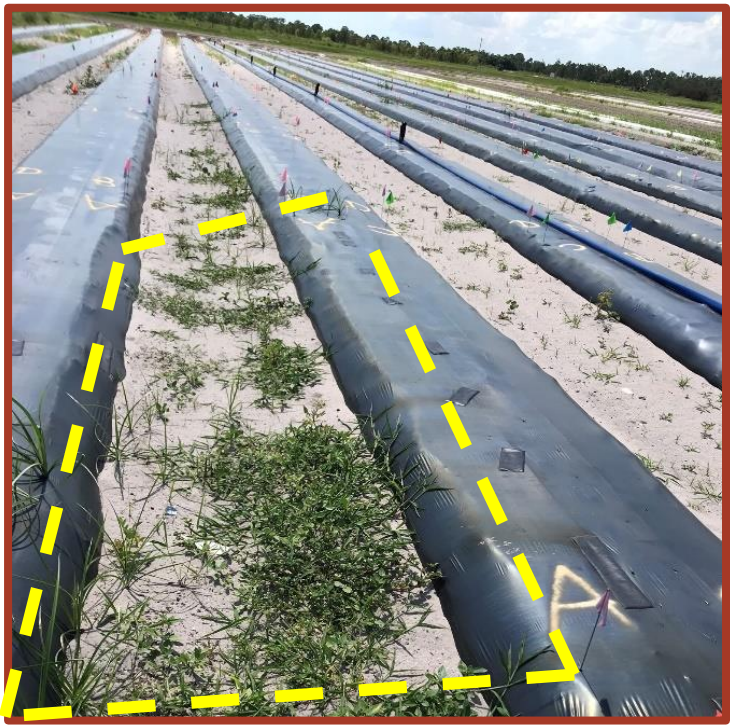
Starviolet
Heydotis sp.

Cupid's shaving brush
Emelia sp.

Row-middle herbicide study

Flumioxazin

Rimsulfuron



Herbicide persistence in soil

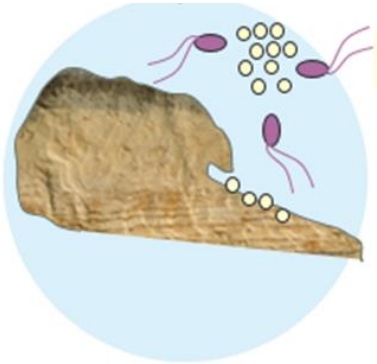
- How long a herbicide stays intact in the soil?

Adsorption
- *Soil binding*

Influence
Influence

Herbicide persistence

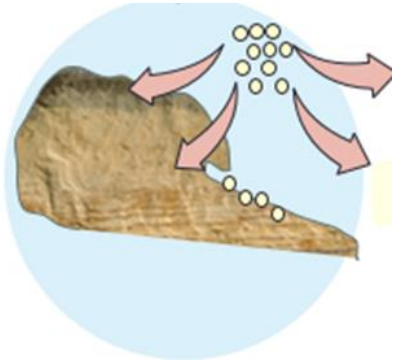
Influence
Influence



Breakdown
- *Half-life*

Influence
Influence

Movement
- *Leaching*



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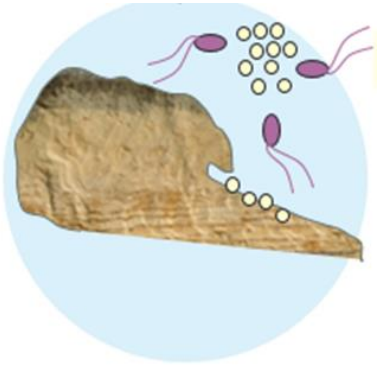

Breakdown
- Half-life

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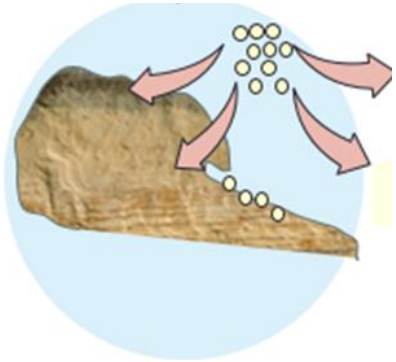
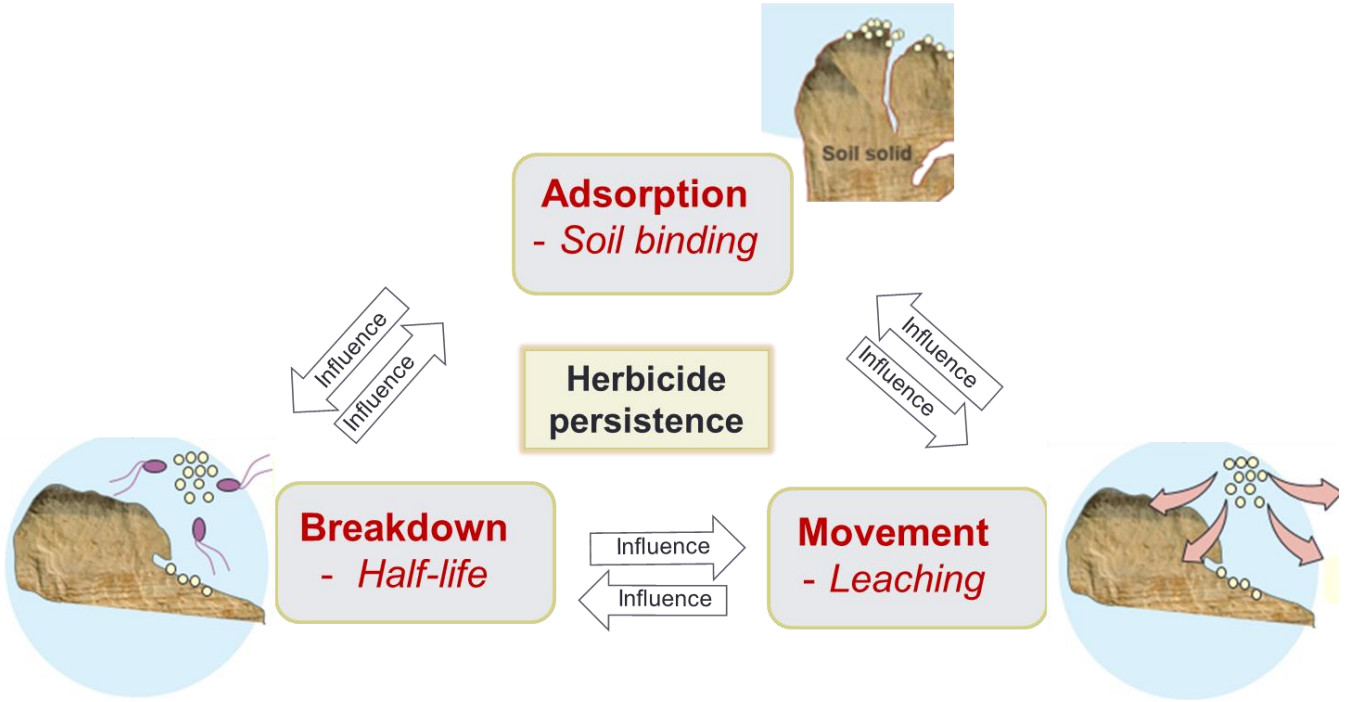


Herbicide persistence in soil

Active Ingredient(s)	*Products*	**Adsorption** *Binding capacity - K_{OC}*	**Movement** *Leachability in sandy soil*
Flumioxazin	Chateau	*557*	*Low*
S-metolachlor	Dual Magnum	*100*	*Moderate*
Pendimethalin	Prowl H_2O	*25455*	*Very Low*
Metribuzin	Metribuzin	*25*	*High*
Sulfentrazone	Spartan	*43*	*High*
Rimsulfuron	Matrix	*55*	*High*
Trifluralin	Trifluralin HF	*6581*	*Low*

Source:
National Pesticide Information Center – NPIC database

Herbicide persistence in soil



Long Persistence

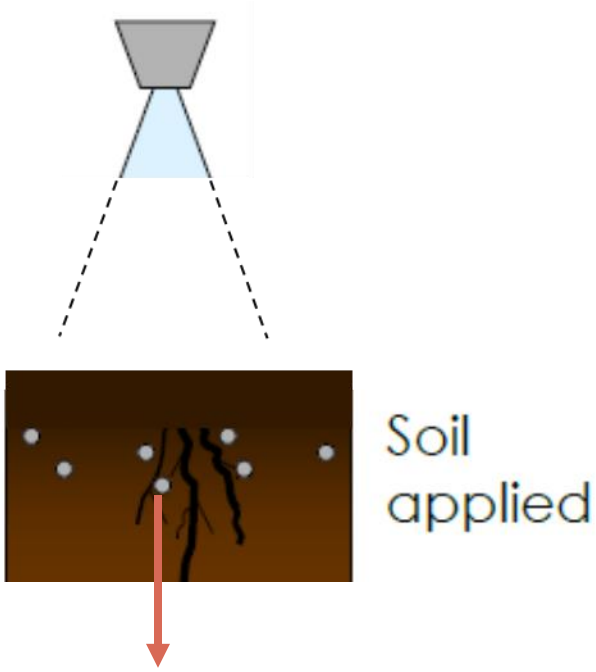
- Good for weed control – extended duration
- But need to watch out – possible carry over toxicity to crops

Nutsedge management is one of the main challenges faced by producers

- **Nutsedge** infestation in plasticulture production

Yellow Nutsedge taking over the plastic beds
Immokalee, FL

PRE-emergent OR Residual herbicides



Suppress weed seeds in soil

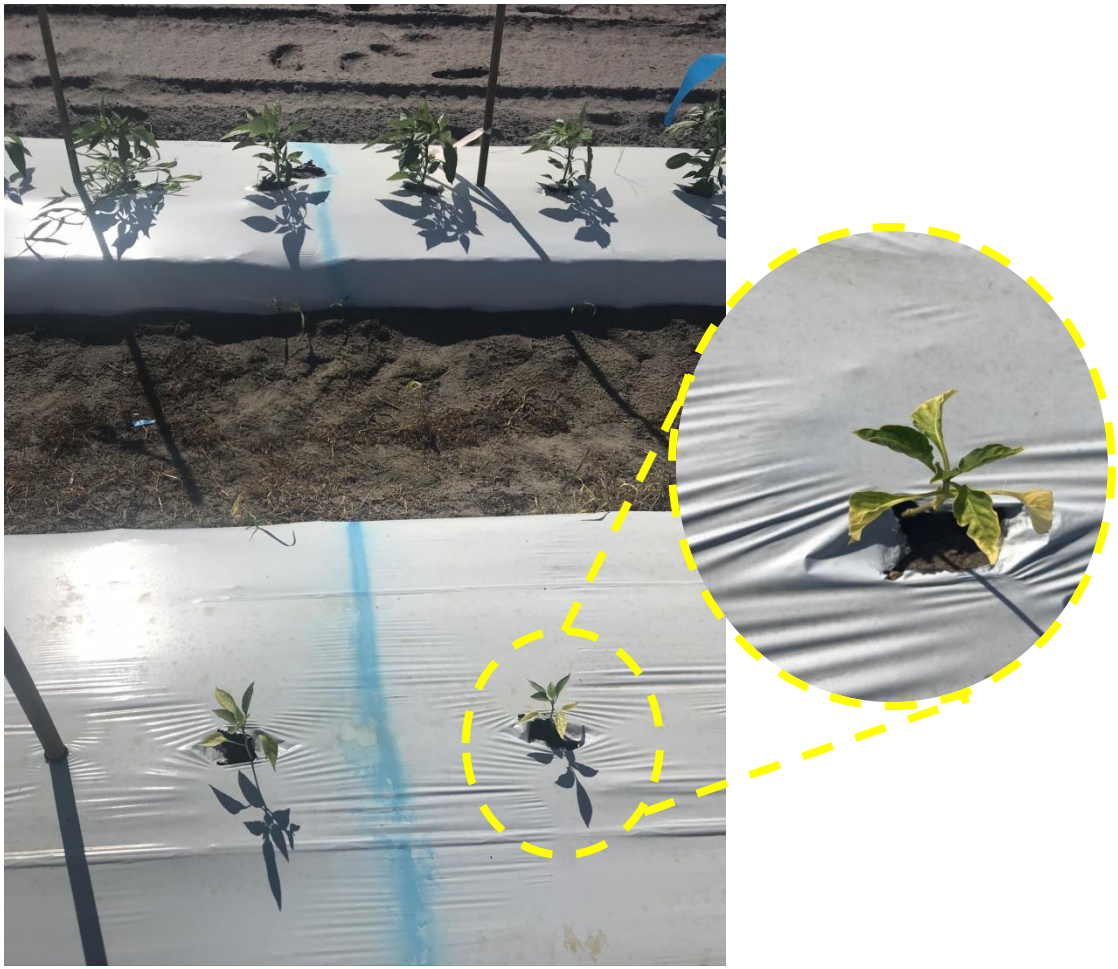
PRE-emergent herbicides on raised beds before installation of plastic mulch

Active Ingredient	*Product*
Fomesafen	Reflex
S-metolachlor	Dual Magnum

Herbicide injury to transplants in vegetable beds is a great concern for growers

- **S-metolachlor** sprays on beds manage nutsedge very effectively

  - But, potentially injure the transplants and could delay their establishment when herbicide get into the root zone.



S-metolachlor (Dual Magnum): injured pepper transplant from metolachlor application under the plastic beds

Ongoing research

Root protectants studied:

- **Activated charcoal**
- **Hydrogel polymers**

Shown potential to prevent herbicide root uptake and injury in pepper transplants.

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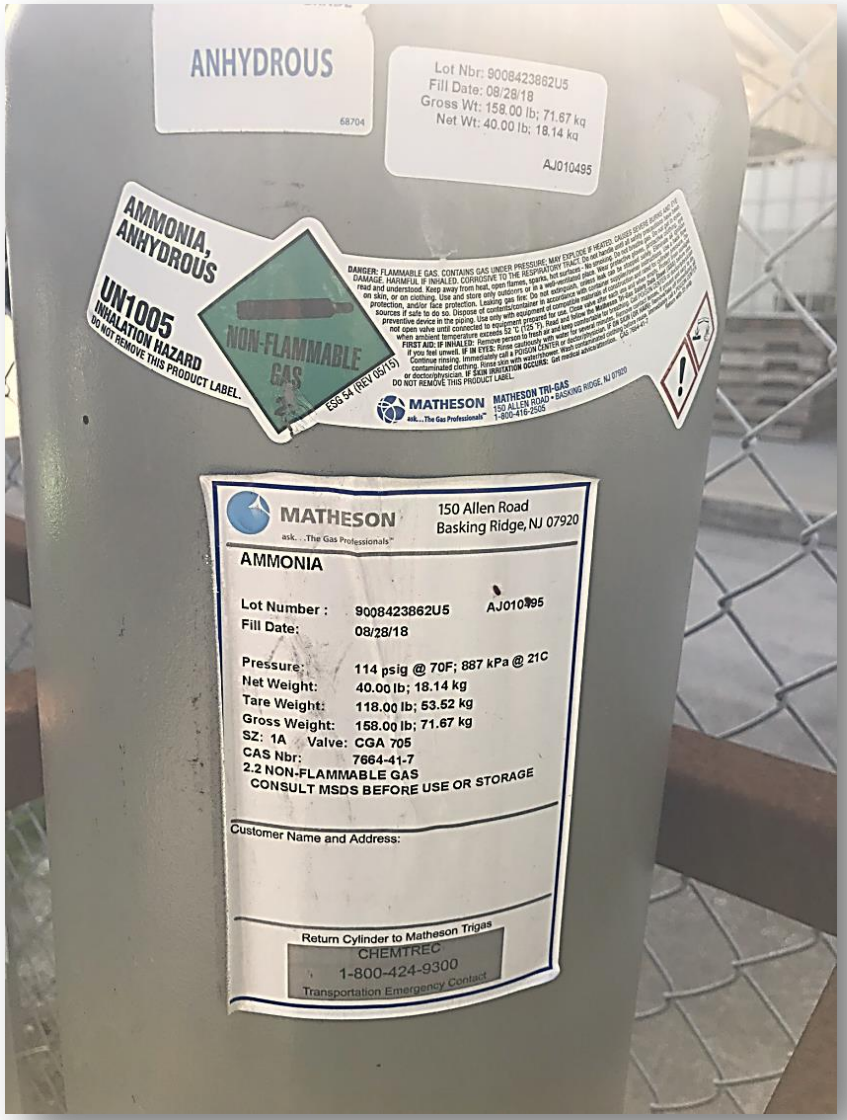
Anhydrous ammonia – alternative fumigant?

- Moves in soil & desiccate weed seeds and tubers

Potential for suppressing

- Nutsedge emergence
- Soil borne pathogens



Anhydrous ammonia – alternative fumigant?

- Moves in soil & desiccate weed seeds and tubers

Potential for suppressing

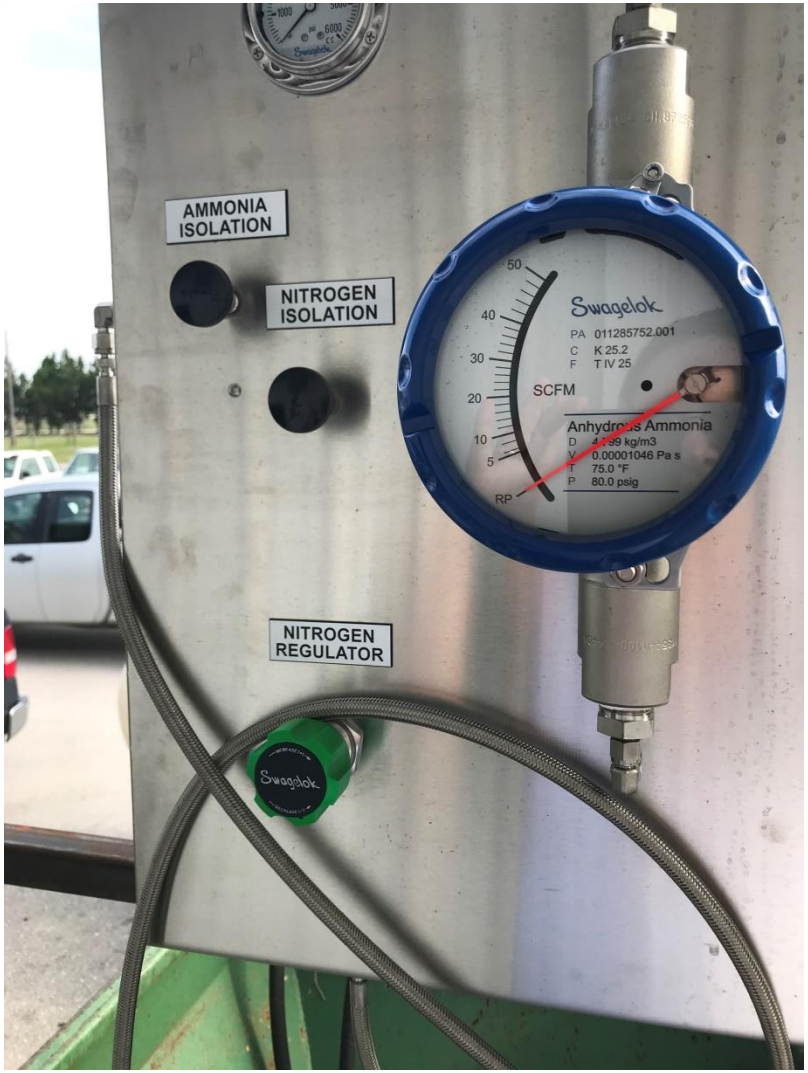
- Nutsedge emergence
- Soil borne pathogens

- Deep Shank Application
  14-16 inches deep from bed top

Anhydrous ammonia tank mounted and applied from a bedder through shanks

Anhydrous ammonia – alternative fumigant?

- Caustic
- Requires Specialized Lines, Training, and PPE



Anhydrous ammonia – alternative fumigant?

Relatively Quick Gas Off

~10 days from our observations in TIF plastic mulches

Ammonia measurements from plastic mulched beds

Anhydrous ammonia – alternative fumigant?

- Anhydrous ammonia applied from a bedder before installing plastic (TIF)

<u>Ongoing Project</u>

Immokalee, FL

Tomato and pepper crops

Low and high rate of application tested

Anhydrous ammonia – alternative fumigant?

- Nutsedge counts on each beds before harvest

Treatment	No. Nutsedge / 100 ft. bed
Untreated Control	11.0 ± 7.6
Pic-Clor 60 / Std rate	2 ± 1.2
An. Ammonia / Low rate	1 ± 0.9
An. Ammonia / High rate	1 ± 0.9

- Replication (n) = 8
- ± Standard Error


Anh. ammonia
Untreated control

Anhydrous ammonia – alternative fumigant?

- Yield from treatments

Treatment	Fruit weight per plot (lbs.)	
	Tomato	*Bell Pepper*
Untreated Control	103 ± 6	27 ± 4
Pic-Clor 60 / Std rate	90 ± 6	18 ± 4
An. Ammonia / Low rate	113 ± 3	25 ± 4
An. Ammonia / High rate	107 ± 9	27 ± 5

- 5 plants harvested per plot
- Replication (n) = 8
- ± Standard Error
- 1 harvest for tomato and 2 harvests for pepper

Summary

Summary: Vegetable weed management

- **POST-herbicide sprays**
  - *Apply before flowering/seeding*
  - *Coverage - Spray volume*
  - *Surfactants and additives*
- **PRE-herbicide programs**
  - *Longer duration weed control in row-middles*
  - *Understand the persistence factors*
  - *Crop-safety*
- **Ongoing project**
  - *Anh. Ammonia as alternative fumigant for beds*
  - *Further evaluation in progress*

Acknowledgements

Dr. Nathan Boyd

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Dr. Pamela Roberts

& SWFREC Weed Science Team

UF IFAS
UNIVERSITY of FLORIDA

FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES
EST. 1868

Thank you…

Contact

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