

# Weed Management in Plasticulture Production Systems



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# Plasticulture production system



Photo courtesy of Dr. Doug Sanders



# Why Control Weeds in Vegetables?

- Increase disease, insect, and animal pests
  - Horsenettle is a host for several disease pests and harbors potato flea beetles, onion thrips, and the potato stalk borer
- Reduce yield
  - Densities of 1 to 3 Eastern black nightshade per hole reduced marketable yield (Buckelew and Monks 2004).
  - Palmer amaranth reduces yield by approx. 70% with 1 weed/crop hole (Garvey and Monks)

# Weeds reduce harvesting efficiency



# CWF Periods for Vegetables

Cucumber	2 to 5 wk	Friesen 1978
Muskmelon Squash	4 to 6 wk	Nerson 1989 Mallet & Ashley 1988
Sweetpotato	2 to 6 wk	Seem, Creamer & Monks 2003
Tomato	4 to 5 wk	Garvey, Monks & Coble 1998
Watermelon	0 to 6 wk	Monks & Schultheis

# Weed Control Effect on Cucumber Yield

<u>Weeds Removed (%)</u>	<u>Cucumber yield (avg. 2yr)</u>
100	13.7
95	7.6
90	6.3
75	4.7
50	5.0
0	1.3

(Friesen, 1978, Weed Sci.)

Weeds removed 24 days after planting.

# Summary

- 5% escapes (95% weed control) resulted in 40 to 50% yield reduction.

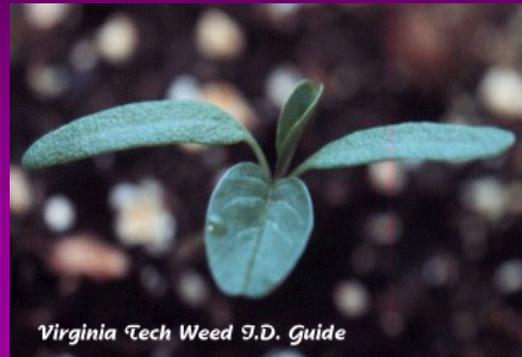
# Top Weeds

- **Large crabgrass**
- **Morningglory species**
- **Nutsedge**
- **Pigweed species, including Palmer amaranth**
  - Palmer amaranth can average up to 2 inches per day
  - Garvey and Monks reported the critical weed free period for Palmer amaranth in plasticulture tomato to be 4 to 5 wks.
- **Nightshade**
  - Densities of 1 to 3 Eastern black nightshade per hole reduced marketable yield (Buckelew and Monks 2004).

\* 1993 NC Grower Survey

# Palmer Amaranth

- Summer annual
- Separate male and female plants (dioecious)
- Petiole/blade ratio ~1:1
- Long, slender seed head
- Extremely small, black seeds





# Glyphosate-Resistant Weeds in Southeast

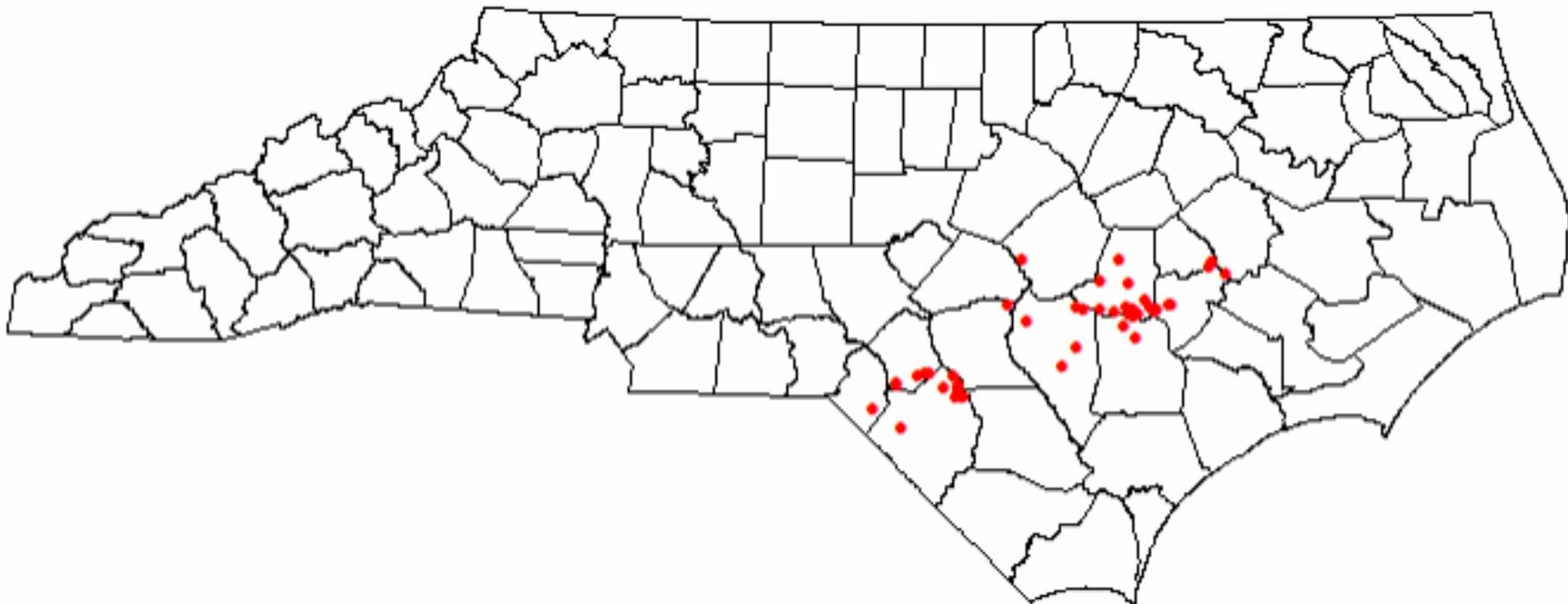
## Glyphosate-resistant weeds in U.S.<sup>1</sup>

	AL	FL	GA	NC	SC	VA
Common ragweed				X <sup>2</sup>		
Common waterhemp						
Giant ragweed						
Hairy fleabane						
Horseweed				X		
Italian ryegrass						
Rigid ryegrass						
Palmer amaranth			XXX 13 co.	XXX 11 co.	XXX 3 co.	

<sup>1</sup> Weedscience.org

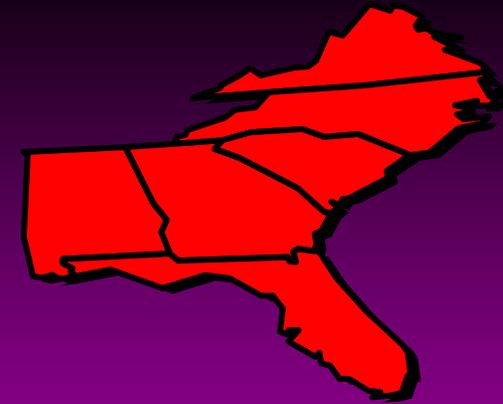
<sup>2</sup> Suspected. Not “officially” confirmed.

# Glyphosate-Resistant Palmer Amaranth in NC



49 of 290 Fields Resistant  
Located in 11 Counties

# Crop Statistics -- Southeast US



	Total acres 10-yr avg. <sup>1</sup>	% of U.S production	% RR
<b>Cotton</b>	<b>3.2 million</b>	<b>23</b>	<b>98<sup>2</sup></b>
<b>Soybean</b>	<b>2.8 million</b>	<b>4</b>	<b>98<sup>3</sup></b>
<b>Corn</b>	<b>2.3 million</b>	<b>3</b>	<b>59<sup>3</sup></b>

<sup>1</sup> USDA, ERS.

<sup>2</sup> USDA, AMS.

<sup>3</sup> Market research. dmrkynetec Corn and Soybean Seed study.



Weathermax 22 oz POST-1  
Weathermax 22 oz POST-2  
Weathermax 22 oz POST-3

# Herbicide Resistance Management

## Focus on Reducing Selection Pressure

- 1. Reduce herbicide reliance (as practical)  
Competitive crop, good agronomics,  
cover crop, cultivation**
- 2. Crop rotation, with appropriate herbicide selection**
- 3. Diversity of chemistry**

**Multiple modes of action within a crop**

**At least 2 MOA's in corn and soybeans, 3 in cotton**

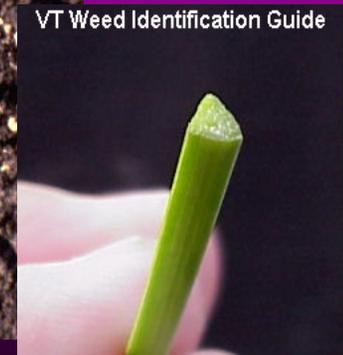
**Residuals**

**Full use rates**

A.C. York 2007

# Nutsedge Species

- Summer annuals and perennials
- Perennials (yellow and purple) most common
- Sedges are not grasses
- Triangular stems
- Sharp tips can puncture plastic mulch



Photos Courtesy of Virginia Polytechnic Institute, Iowa State University, University of Missouri and Auburn University

# Nutsedge chains



# Nutsedge on plastic covered beds



# Nutsedge Management in Crops

Crop	Herbicide	Timing
Strawberry	None	None
Tomato	Sandea Envoke Dual Magnum	PRE/POST POST-Directed PRE
Cucurbits	Sandea (Crop limitations)	PRE and POST
Bell Pepper	None	None

- Yellow (*Cyperus esculentus*) and purple nutsedge (*C. rotundus*) problematic in plasticulture



# Methyl bromide alternatives

- New chemistries
- New techniques
  - VIF or TIF mulches
  - Mustard cover crops
  - Drip applied herbicides



# Plasticulture Bell Pepper Systems Utilizing 'Caliente' Mustard, Dual Magnum, and Imazosulfuron





# Stand and Injury

- Bell pepper stand not reduced
- Injury was  $<7\%$  at all rating times
- Injury due to Dual Magnum at 1.5 pt/A observed in 2007



# Conclusions

- In this production system, little to no benefit of 'Caliente' mustard observed
- Dual Magnum controlled or suppressed weeds in plasticulture system
  - May cause injury at 1.5 pt/A
- Imaz. POST-DIR suppressed yellow nutsedge and is safe in bell pepper
  - Application technique and plant size important

# Final Thoughts

- Spring-seeded and incorporated 'Caliente' mustard will not be a component of future bell pepper weed mg't programs
- New herbicide options are available for bell pepper
  - Providing registration can be obtained
- Combining tactics may be necessary in the absence of MeBr

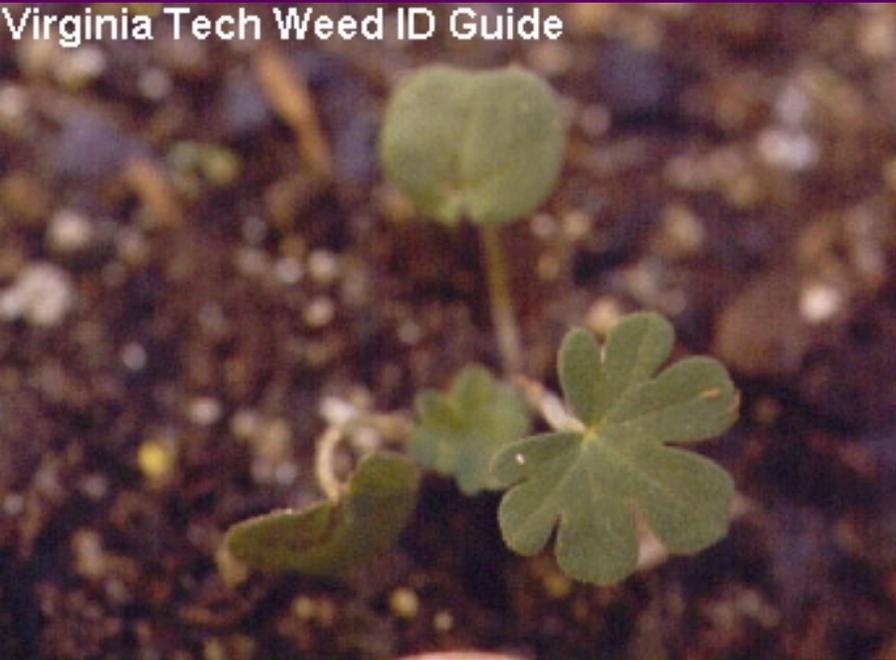


# Problem Winter Weeds in Strawberry



# Carolina geranium

Virginia Tech Weed ID Guide



# Cutleaf evening primrose



# Curly Dock



# Henbit



# Common chickweed



# Vetch Control with Stinger

- Annual weed that is problematic in strawberry.
- Contaminant in straw. Know your source!
- 



# Weed Response to Preemergence Herbicides in Strawberry

	Yellow Nutsedge	Carolina Geranium	Cut. Evening Primrose	Vetch	Henbit	Curly Dock	Chick	Annual Grasses
Chateau	N	---	G	N	GE	N	GE	F
Devrinol	N	N	N	G	N	N	G	G
Goal	N	GE	GE	N	GE	GE	GE	F
Ultra Blazer*	N	---	---	N	---	---	---	F
Prowl H <sub>2</sub> O	N	N	N	N	FG	N	F	G

\*Data is limited but activity is probably similar to activity from Goal.





## Vetch Control with Stinger



# Can I Plant Vegetable Crops Following the Application of Stinger to Strawberries?

- Stinger label states that a field bioassay is recommended for any broadleaf crop not listed in the rotational interval table.
- Do not rotate to unlisted crops prior to 10.5 months after application of Stinger.
- Tomato, pepper and cantaloupe are not listed in the rotational interval table.

# Can I Plant Vegetables Following the Application of Stinger?



# Stinger Carryover to Vegetable Crops

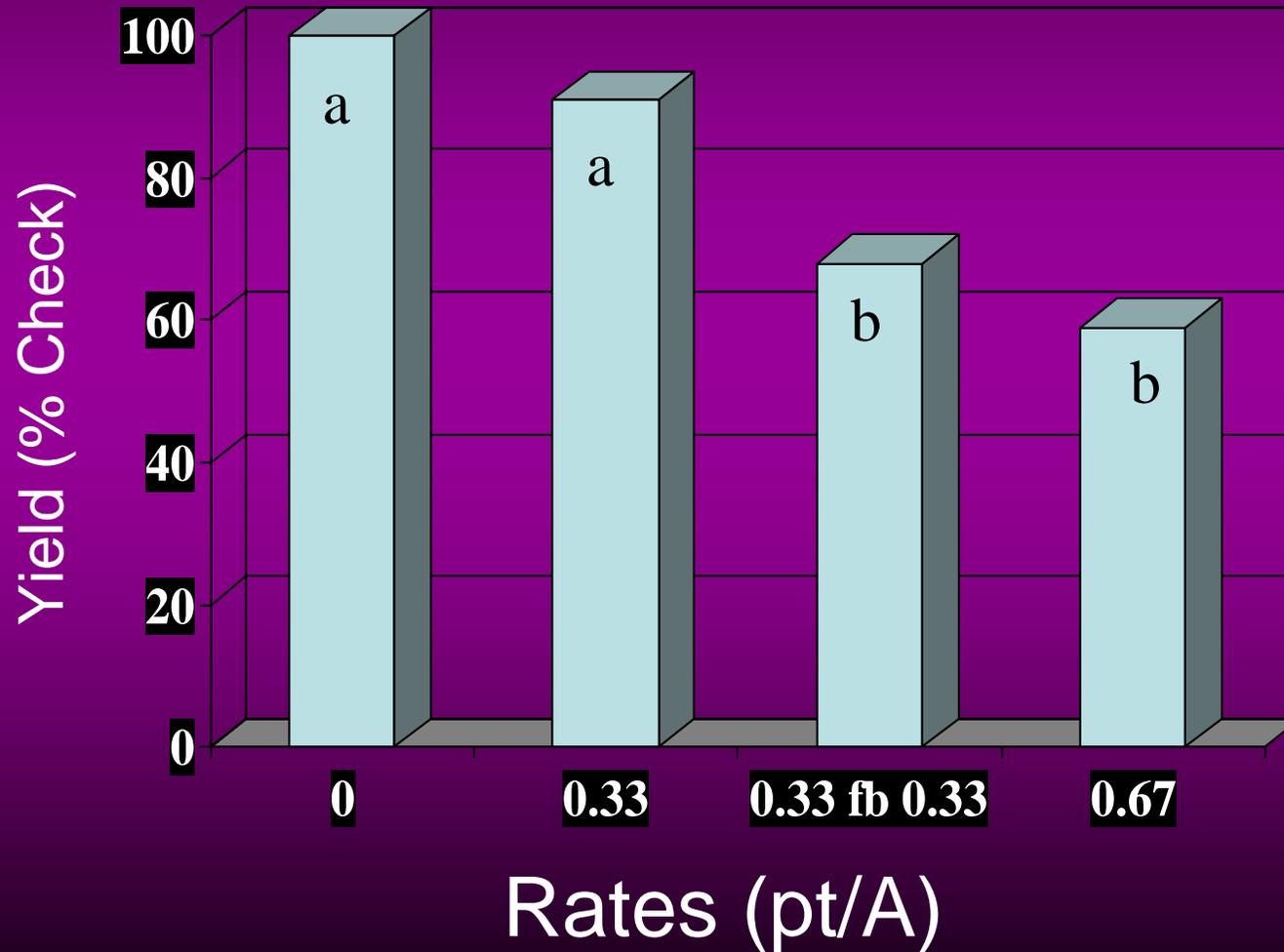
- Tomato and pepper
  - Crop injury on foliage.
  - Misshapen fruit.
  - Reduction in yield.
- Cantaloupe
  - No visual injury.
  - No effect on yield.



# Effect of Stinger on Tomato Injury



# Effect of Stinger on Marketable Tomato Yield



# Effect of Stinger on Tomato Fruit (Amelia Variety is a round type variety)



# Resources

- Wolfpack Weeds web site
  - <http://www.wolfpackweeds.com/index.php>
- NC Agricultural Chemicals Manual
  - <http://ipm.ncsu.edu/agchem/agchem.html>
- NCSU Plant Disease and Insect Clinic
  - <http://www.cals.ncsu.edu/plantpath/extension/clinic/>
- Virginia Tech Weed ID
  - <http://www.ppws.vt.edu/weedindex.htm>
- CDMS for pesticide labels
  - <http://www.cdms.net/LabelsMsds/LMDefault.aspx?t>

# Contact Information

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