

Taming Pigweeds and Stewardship of Technology

University of Tennessee

Larry Steckel

Palmer Amaranth: Don't go here



Off-Target Dicamba in the Midsouth



Pigweed are the driver weeds!





**Taproot of
*A. Palmeri***

Soybeans Planted to Clean Soil on May 16

Picture Taken May 29



Pigweeds

Green Pigweed

Tumble Pigweed

Smooth Pigweed

Pigweed ID



Palmer

Smooth

Redroot

Green

**Waterhemp Short Flowering
Branches**



**Palmer Long
Flowering
Branches**



Pigweed ID



PPO Resistant Palmer Amaranth

Resistant to glyphosate and Flexstar

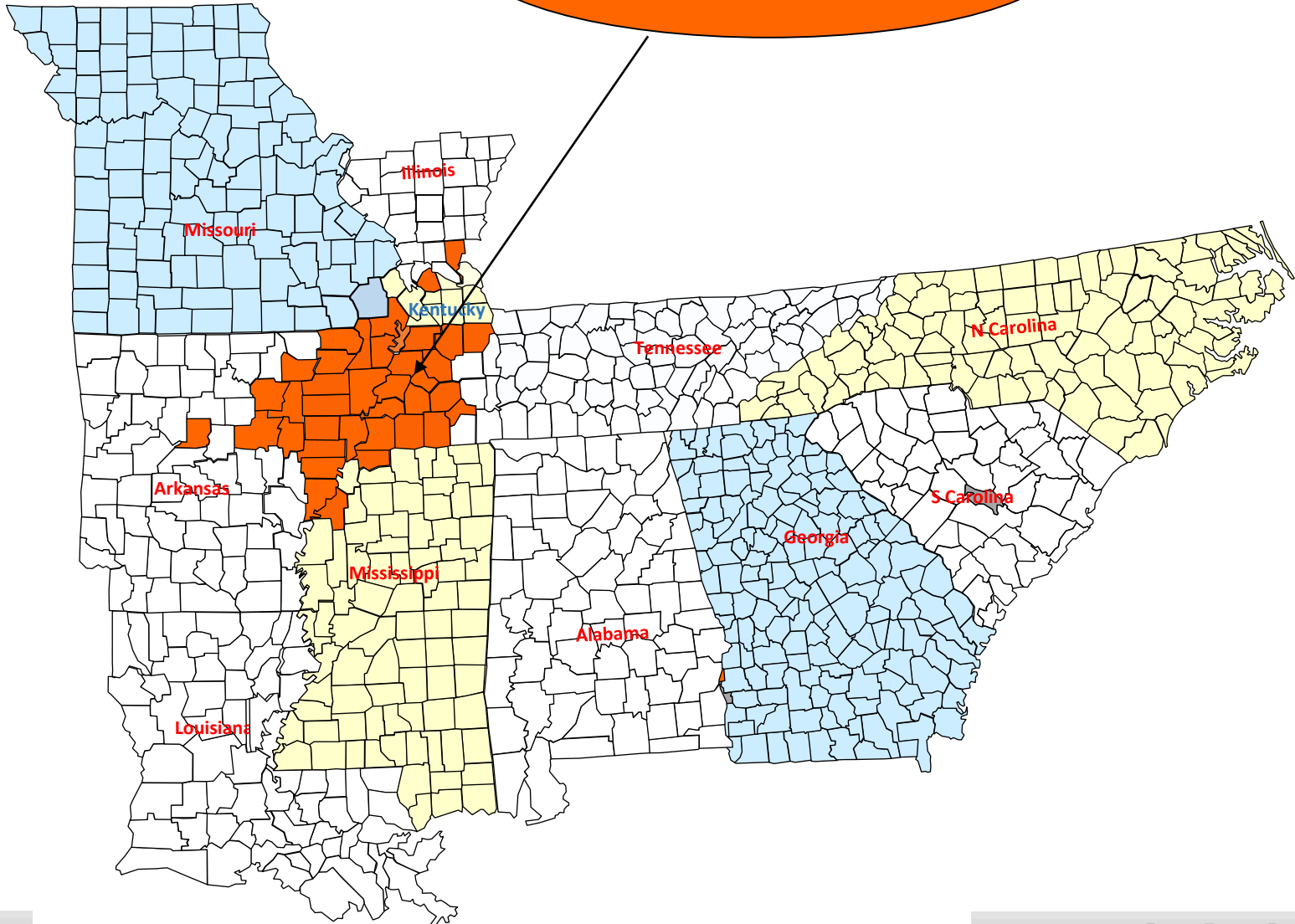
GLY/PPO Resistant Palmer Amaranth

Resistant to glyphosate, Flexstar, Cobra, Ultra Blazer



Glyphosate and PPO - Resistant Palmer Amaranth

*PPO/Gly- resistance in 4 out of 10 fields
Resistance ranged from 10 to 97%*



Cotton Herbicide Trait Break out 2016

- **Cotton Variety Planted in TN:**
 - ❖ **73%* Roundup Xtend Cotton Varieties**
 - ❖ **27% Liberty Link Cotton Varieties**

- **About 90% of our cotton acres received Liberty over the top**
 - ❖ **Average Liberty Applications 2.5**
 - ❖ **50% of cotton was hand weeded**

* USDA agricultural marketing service mp_cn833

Soybean Herbicide Trait Break out 2016

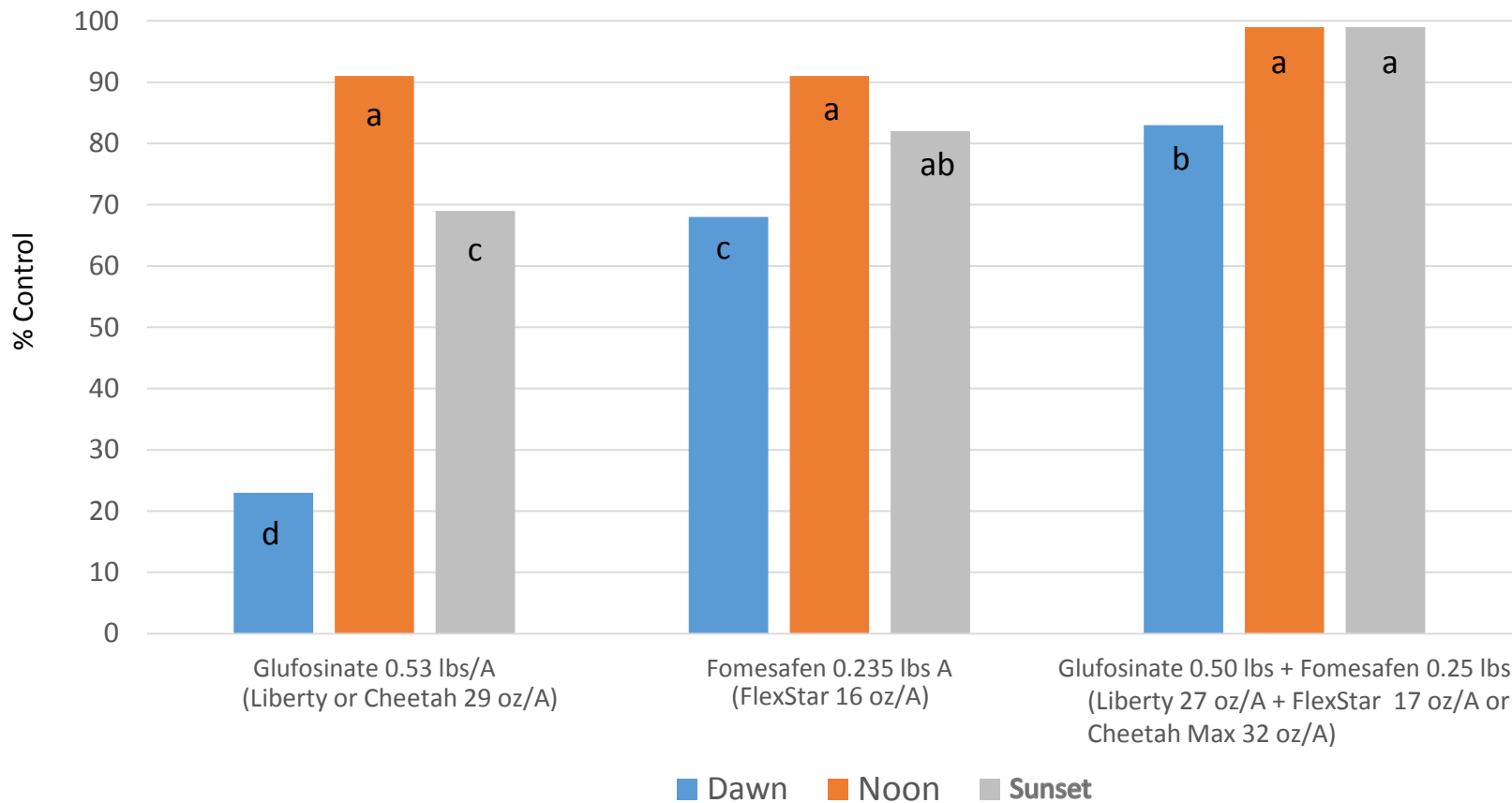
- **About 55%* of TN soybeans were RR or Conventional**
 - **About 40% of our soybeans were LL**
 - ❖ **In our worst Palmer counties 80% of the soybeans were LL**
 - **About <5% were Roundup Xtend II soybeans**
- *my estimate**



Time of Day Affect on PPO-Susceptible Palmer Amaranth Population 2015.

Application to 4" Palmer

Ratings taken 13 DAA



G. Montgomery and Steckel 2015



Applied 12 to 16" tall Palmer amaranth



LIBERTY 280 2.34 SL
29 fl oz/a Sunrise +1hr



Applied to 12 to 16" tall Palmer amaranth

LIBERTY 280 2.34 SL
29 fl oz/a Sunrise +1hr
FLEXSTAR 1.88 SL
16 fl oz/a Sunrise +1hr
MSO L
1 % v/v Sunrise +1hr

Applied to 12 to 16" tall Palmer amaranth

LIBERTY 280 2.34 SL
29 fl oz/a Sunrise +1hr
COBRA 2 EC
10 fl oz/a Sunrise +1hr
MSO L
1 % v/v Sunrise +1hr

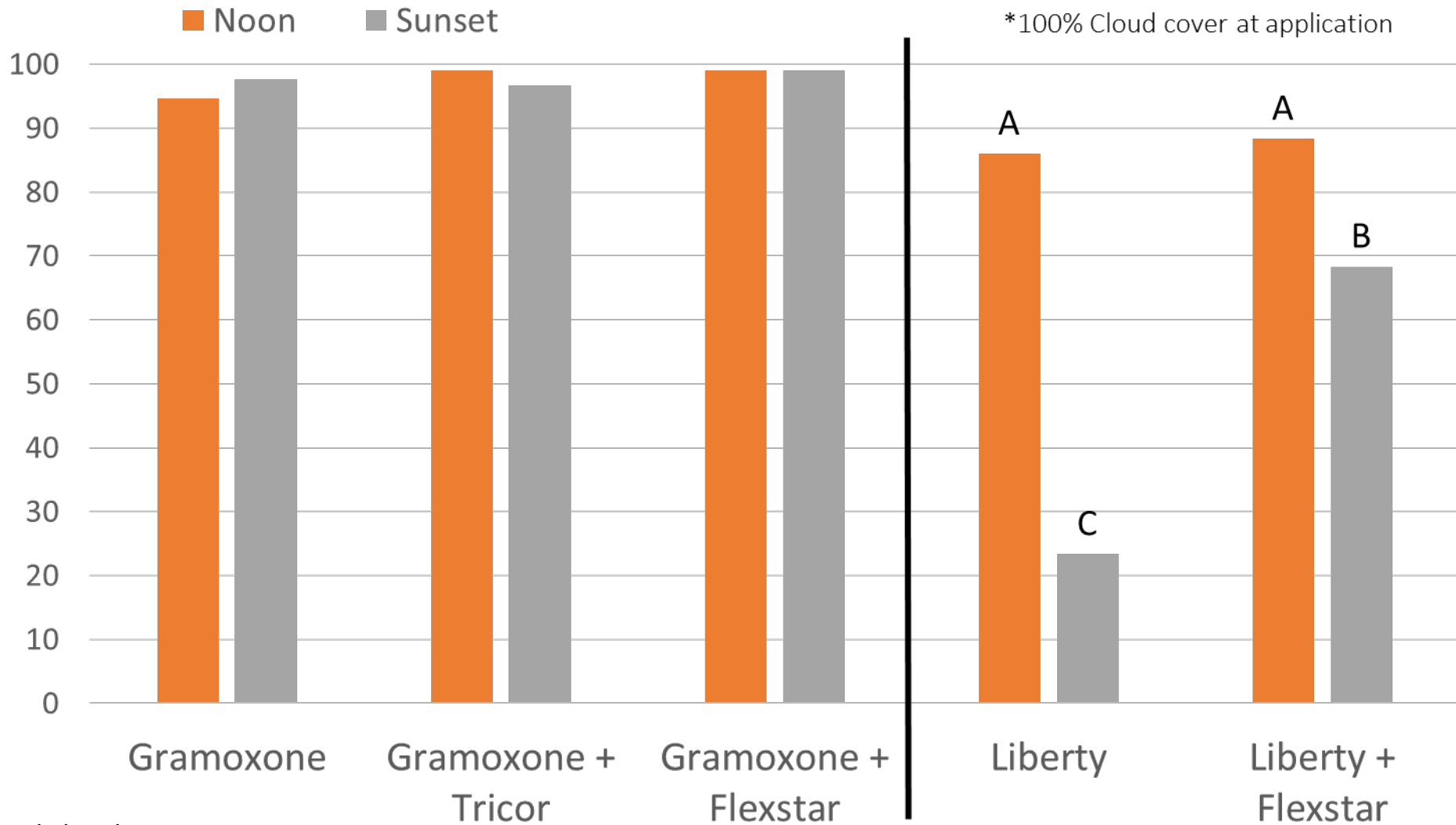
Applied to 12 to 16" tall Palmer amaranth

LIBERTY 280 2.34 SL
29 fl oz/a Noon

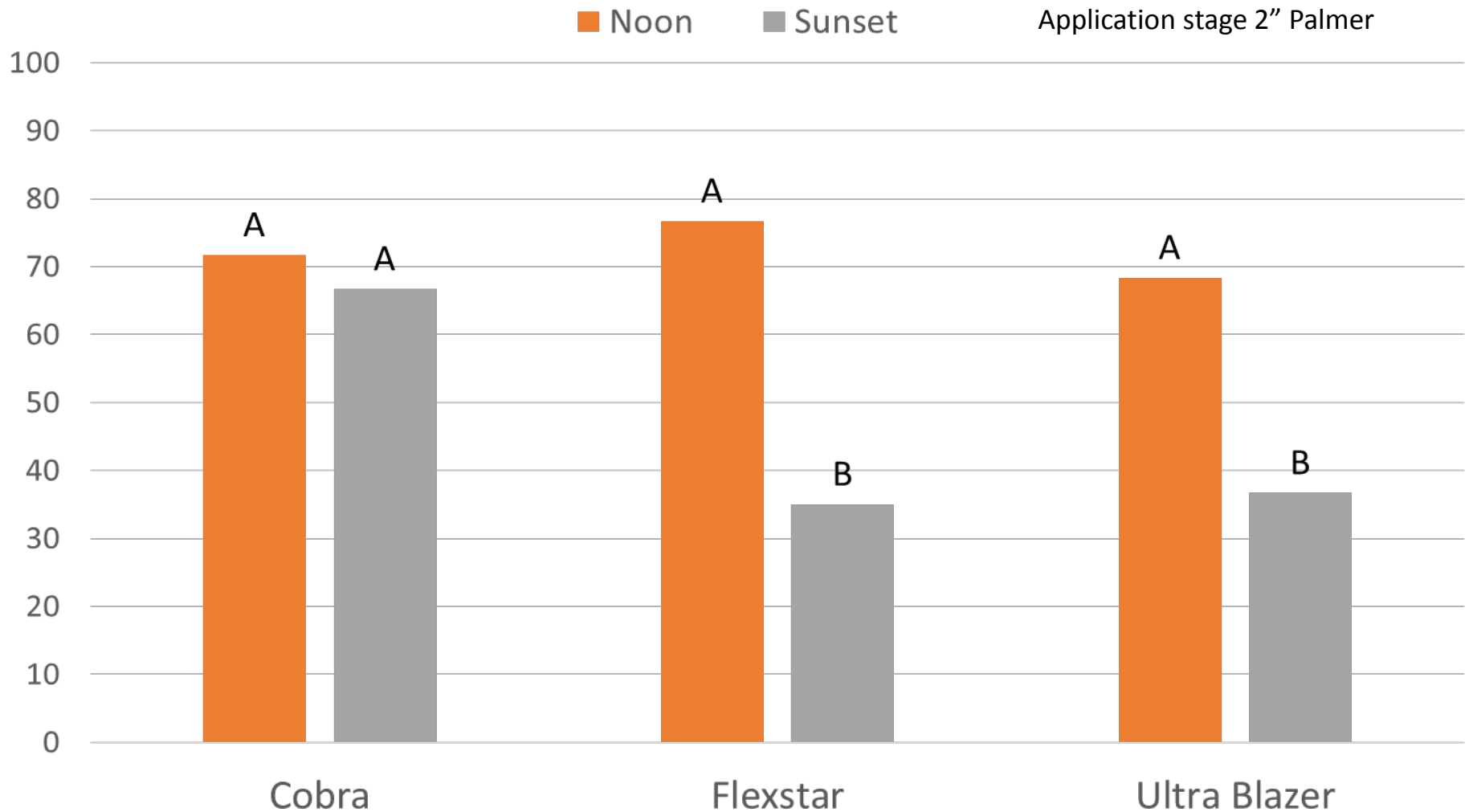
Applied to 12 to 16" tall Palmer amaranth

**LIBERTY 280 2.34 SL
29 fl oz/a Noon
FLEXSTAR 1.88 SL
16 fl oz/a Noon
MSO L
1 % v/v Noon**

20% PPO Resistant Palmer Control 7 DAT



20% PPO Resistant Palmer Population Control 7 DAT



Management of PPO and Glyphosate-Resistant Palmer amaranth

- Liberty Link last good POST option
 - ❖ Liberty should be mixed with PPO herbicide
 - More consistent pigweed control
 - Mitigate anymore PPO resistance and delay Liberty resistance
 - Not as effective on PPO resistant Palmer amaranth

- Liberty should be applied from about an hour after sunrise to an hour before sunset for best results.

- Liberty should be applied at 15 to 20 GPA with nozzles that provide good coverage.

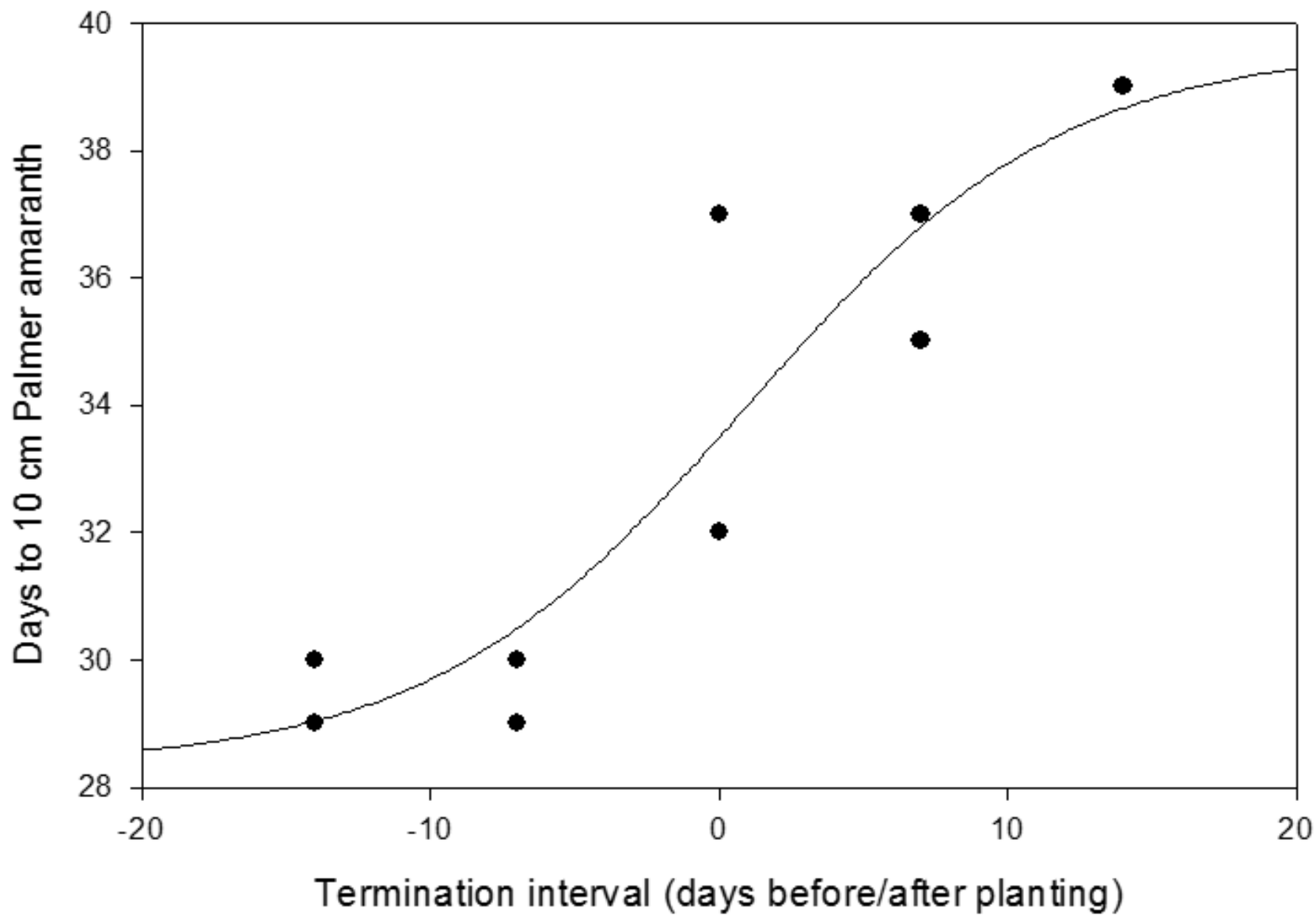
Management of PPO/GR Resistant Pigweed in Soybean

Pre Emergence	<u>14 DAP</u>	<u>28 DAP</u>
<p>Metribuzin and Zidua, Dual Magnum, Outlook based PRE</p> <p>Pyroxasulfone based products (Zidua, Fierce, Anthem)</p> <p>Metribuzin for best pigweed control at least need 5.5 to 6 oz/A (soil type and sensitive varieties)</p>	<p>16 oz Dual Magnum or 32 oz Prefix or 2.5 oz Zidua</p>	<p>16 oz Dual Magnum or 32 oz Prefix</p>

Cereal Rye - Vetch Blend Cover



Cover Terminated 14 DAP Roundup Xtend Soybeans



● Days to 10 cm Palmer

$R^2 = 0.8609$

Costs – Liberty Link

Cover	Prior to Planting	EPOST	LPOST	Total
Wheat	\$14.00	\$32.50	\$18.00 (if needed)	\$46.50- \$64.50
Wheat + Clover	\$33.49	\$32.50	-	\$64.99
Wheat + Clover**	\$18.49	\$32.50	-	\$50.99
No Cover	\$48.21	\$32.50	\$18.00	\$98.71

Integrating Cover Crops

Positives

- Can be part of a herbicide resistance management program.
- Can greatly help on control of GR horseweed and help suppress GR Palmer amaranth.
- Can make weed control with new HT technologies more consistent and sustainable

Concerns

- Timing of fall sowing critical
- Increase insect pest issues “green bridge”

TN Extension Spent June – August Fielding Dicamba Fall Out



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Resistant to glyphosate and Flexstar

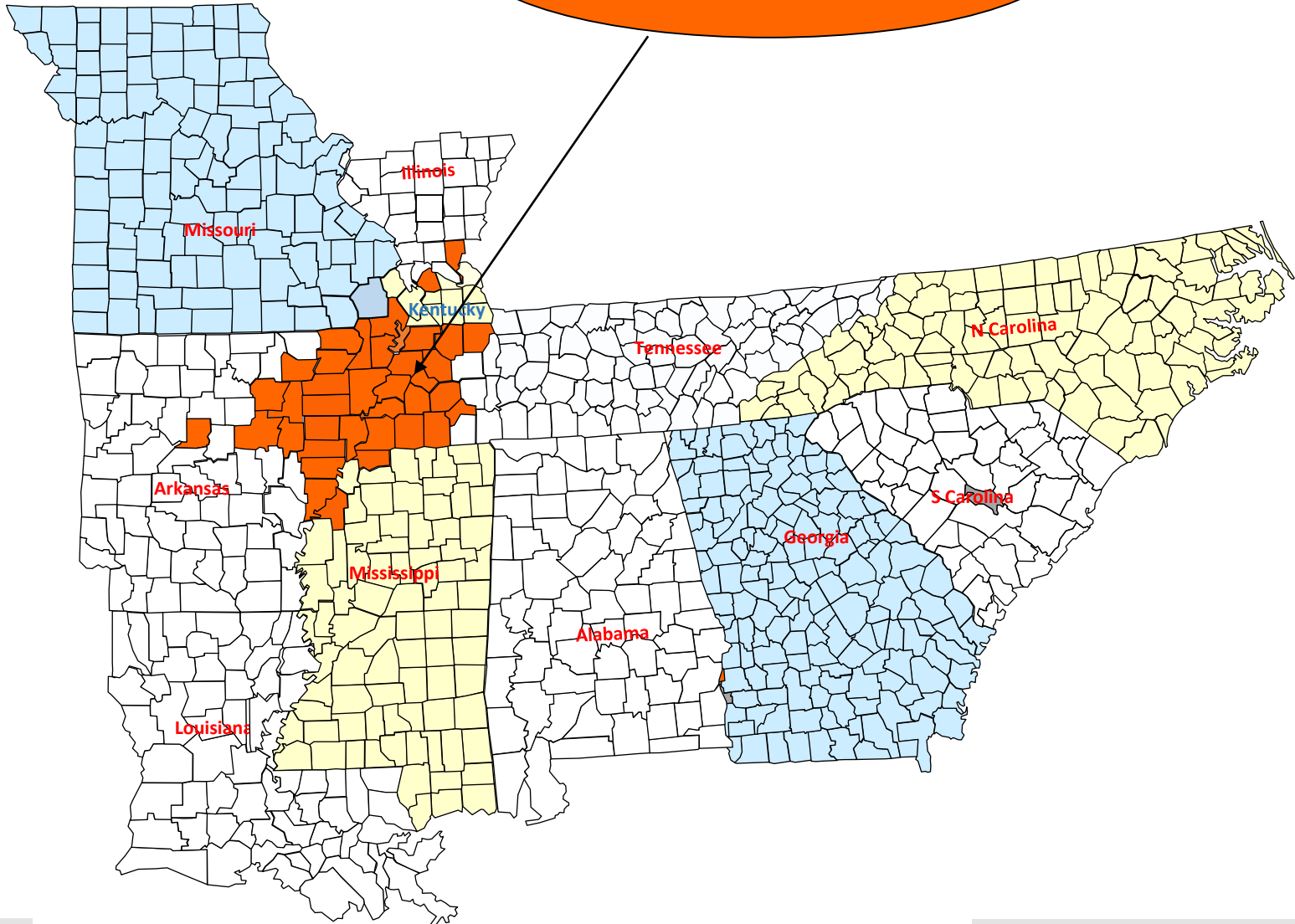
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Glyphosate and PPO - Resistant Palmer Amaranth

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Where are we with Enlist and Xtend traits?

Trait	Crop	Regulatory status	
		Traits Deregulated	Herbicide Registration
Enlist	Corn	September 2014	October 2014*
	Soybean	September 2014	October 2014*
	Cotton	July 2015	Awaiting EPA
Xtend	Cotton	January 2015	Awaiting EPA
	Soybean	Late Spring 2016	Awaiting EPA

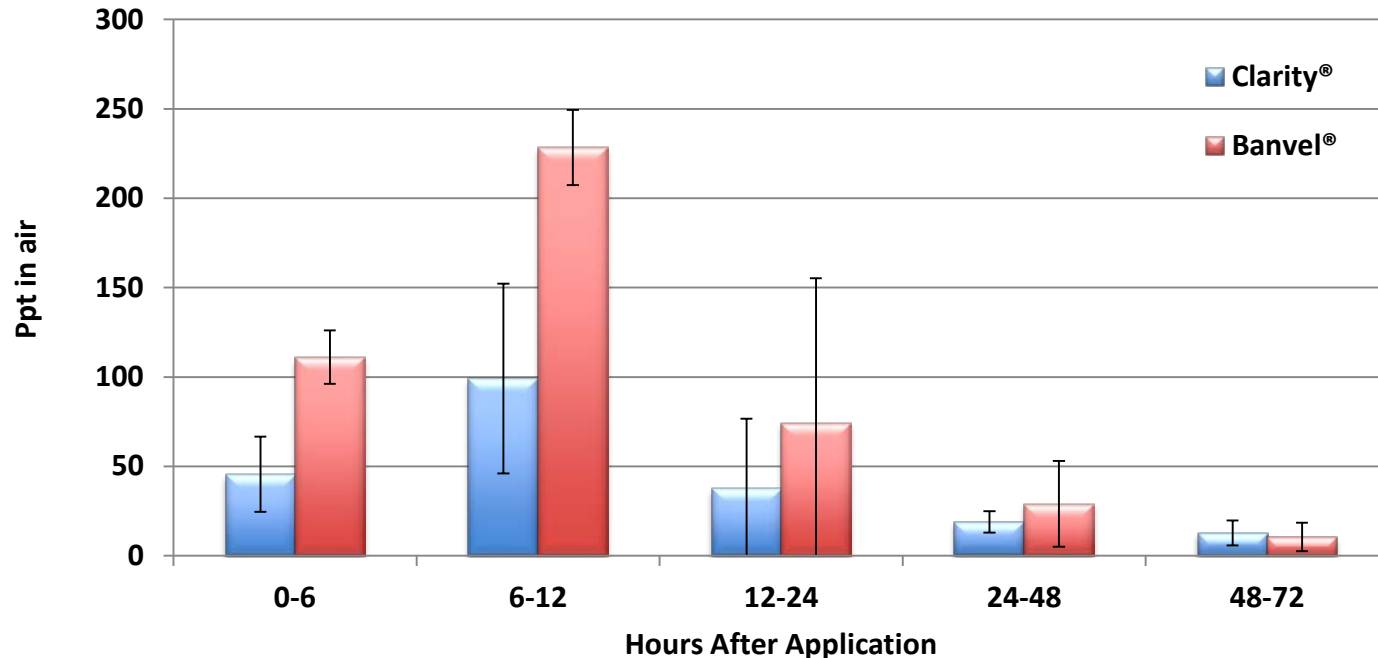
* Enlist Duo; registered in 15 states (TN, KY, NC and GA not included)



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Field Volatility Results Reported in 2010

Volatile Dicamba Detected in Field Measurements
Average of Three Trials applied Early Morning



Trials Sprayed Early Morning

1 lb/A ae (32 oz/A) Application Rate, on NoTill RR Soy

Calm winds at application

Daily Temperature Range 60 – 95 °F

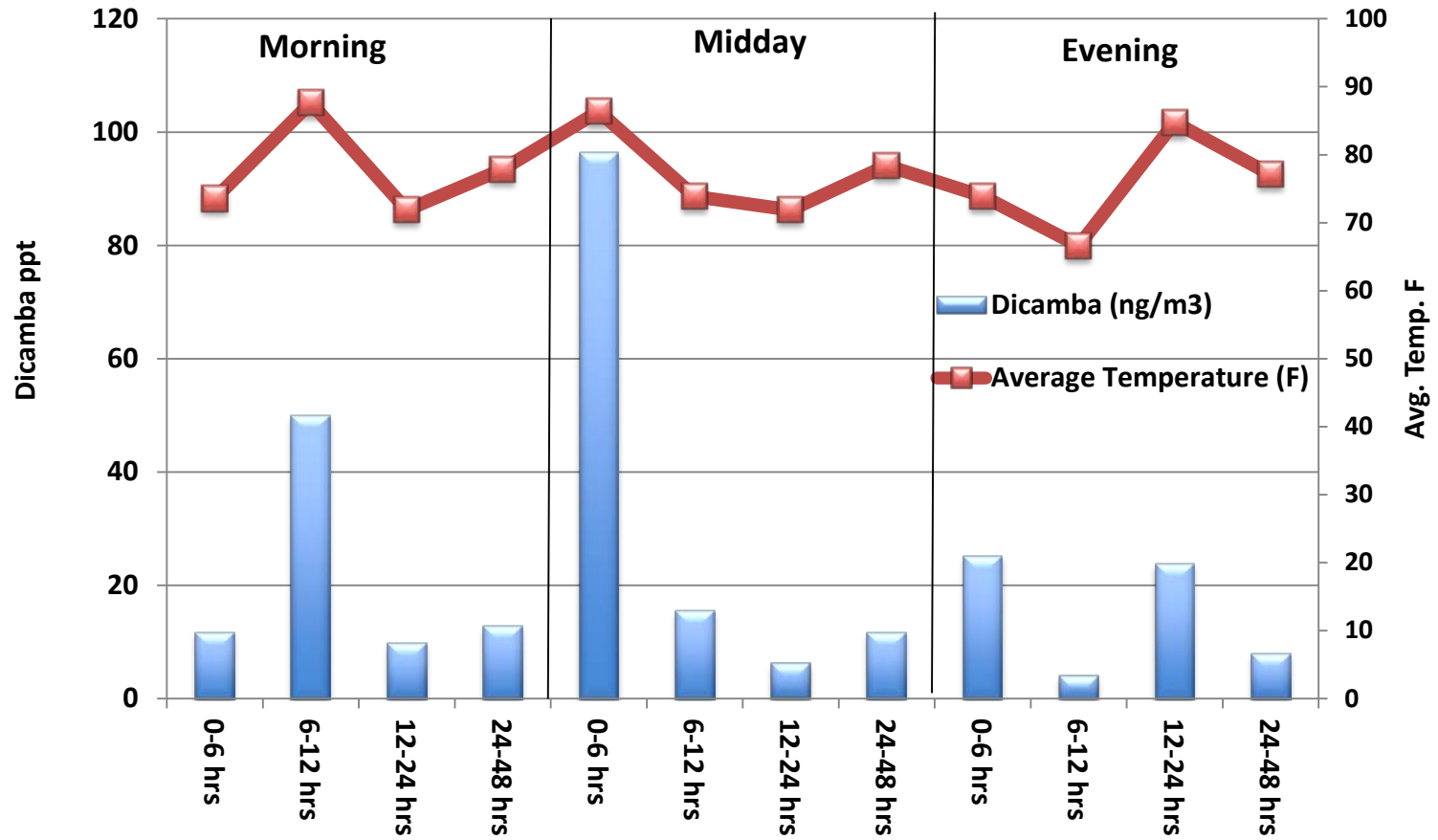
Detection in the Center of 50 X 50 plot

Mueller, et.al. SWSS 63rd Annual Meeting Jan 25-27, 2010

SWSS 65th Annual Meeting Jan 23-25, 2012

Results

Volatile Dicamba and Average Temperature, June 2 - 4, 2010



“It” went miles!!!

Soybean Symptoms



Complaints to TDA

- **There were 47 “Official” complaints filed with TDA**
 - ❖ **Thousands of acres**
 - ❖ **Mostly soybean, cotton**

- **Field calls**
 - ❖ **Ran calls 2 to 3 days a week for 6 weeks**
 - ❖ **Roughly 30,000 acres of soybean**
 - ❖ **County agents ran many others**

Not Helpful!!!

they are otherwise, they're good beneficials in a cotton crop."

Kemp applied 40 ounces of Pix to control rankness. He expects to start picking mid-September, after defoliating with a two-shot application of Def and Dropp and Prep-to-open bolls. If there are no major problems between now and harvest, Flint says after pulling up a stalk and counting bolls, the crop could yield 2.5 to 3 bales. Kemp's cotton is ginned at Linwood Gin Company, Lumberton, Miss.

Triplett, noting that the lateral roots of the stalk that was removed were fairly near the surface, says with a mulch cover, "You get greater moisture retention near the surface, and roots can more efficiently utilize rainfall that would otherwise run off had the soil been tilled."

Triplett has dug a spadeful of soil: "No-till can reduce erosion potential 50 to 100 times that of disking and planting into bare soil. Look at the dark, rich layer of organic matter near the surface. And he's got a lot of 'friends' working for him (earthworms). If you feed them with decomposing surface residue, they will work for you. Earthworms create the size of soil pores, which can significantly increase rainfall infiltration. As you double the size of a soil pore, the infiltration rate increases four times. More rainfall infiltrates the soil rather than running off."

Kemp responds: "No matter where I've gone in the fields during the season, I've found earthworms at work."

Four days prior, he says, "We had a 6-inch rain. And there were other rains in the same field. With that kind of rainfall on tilled land we had gullies ankle deep or more. But there has been no detectable gullying anywhere. I've had excellent soil infiltration, and I've had almost sediment-free."

WATER

While, Flint, has filled a bottle from water trickling from the field into a nearby creek. "Look how clear it is," he says. "There are no soil particles in it."

"I've never seen it enough with no-till to know for sure," says Kemp. "My late father was the first in these parts to move to no-till. He believed in it. He grew cotton here — he and a brother had as much as 400 acres scattered all over this county. I love the crop rubbed off on me. I grew up in cotton fields. I was in cotton when I was 16, and I've been with the crop ever since. I'd rather do anything else."

There are many advantages to no-till, Flint says, sometimes farm-folks switch from conventional tillage to no-till aware that no-till requires more attention, not less. A successful no-till system requires more attention, and that's what Flint has handled well."

For this fall/winter could be better than farms now, Triplett suggested.

"I'm probably going to do that, most likely with wheat," Kemp says.

Flint notes that wheat offers more options than rye, "which is hard to get rid of if you're going to plant corn behind it. Also, with wheat, if the price is good, the grower can let it mature, get income from the grain, and then plant soybeans. Another advantage of planting soybeans into wheat stubble is if you've got a bad deer problem — they don't like to put their noses into stubble, and won't damage young soybeans the way they would in a no-stubble field."

While Kemp says he hasn't had a problem with deer on the farms here, "On some of my Leake County land, they've done a lot of damage to soybeans. Wild hogs are also a problem in some areas there."

Here in the hills where tree farms predominate, Kemp says there aren't that many areas of open land. "Except for these two farms, I work small patches. This year, in addition to the cotton, I have 370 acres of corn and 360 acres of soybeans. Most of those fields are in fairly close proximity, but these two farms are 32 miles from my house. My brother-

in-law, Tim Hobby, has a low boy trailer that I use to transport equipment here. On mostly small fields, I'm pretty much limited to 4-row equipment, so I don't have a large investment for big machinery."

Kemp says he also still has a few cows and for several years he had a 12-house poultry operation, selling his birds to a nearby Koch Foods processing plant. "But I sold the houses, and I have a manager for six I kept. He's been with me 12 years. He does an outstanding job, which frees me to look after the row crops."

ASGROW
ASGROW.COM/ROUNDUPREADY2XTEND

ROUNDUP READY 2 XTEND SOYBEANS

"THE FIELD WAS SPOTLESS"

STEVE MINNER
CORN AND SOYBEAN FARMER
MORLEY, MO

"I was able to spray dicamba on my Asgrow® Roundup Ready 2 Xtend® production acres this season and the field was spotless. I can't wait for dicamba to receive regulatory approvals to help control tough pigweed."

Steve Minner

**PLANT ASSURED
PLANT ASGROW**

SEE WHAT OTHER FARMERS ARE SAYING WITH #MyFarmMyYield
f t

My Take Home

- **Off Target Dicamba in TN 2016**
 - ❖ **Some used dicamba near planting and/or POST**
 - ❖ **Some sprayed dicamba numerous times**
 - ❖ **Dicamba rate was 0.5 to 1 lb/A**
 - ❖ **All salt formulations DGA, DMA and acid were used**
 - ❖ **Most were shocked at how far it went!**

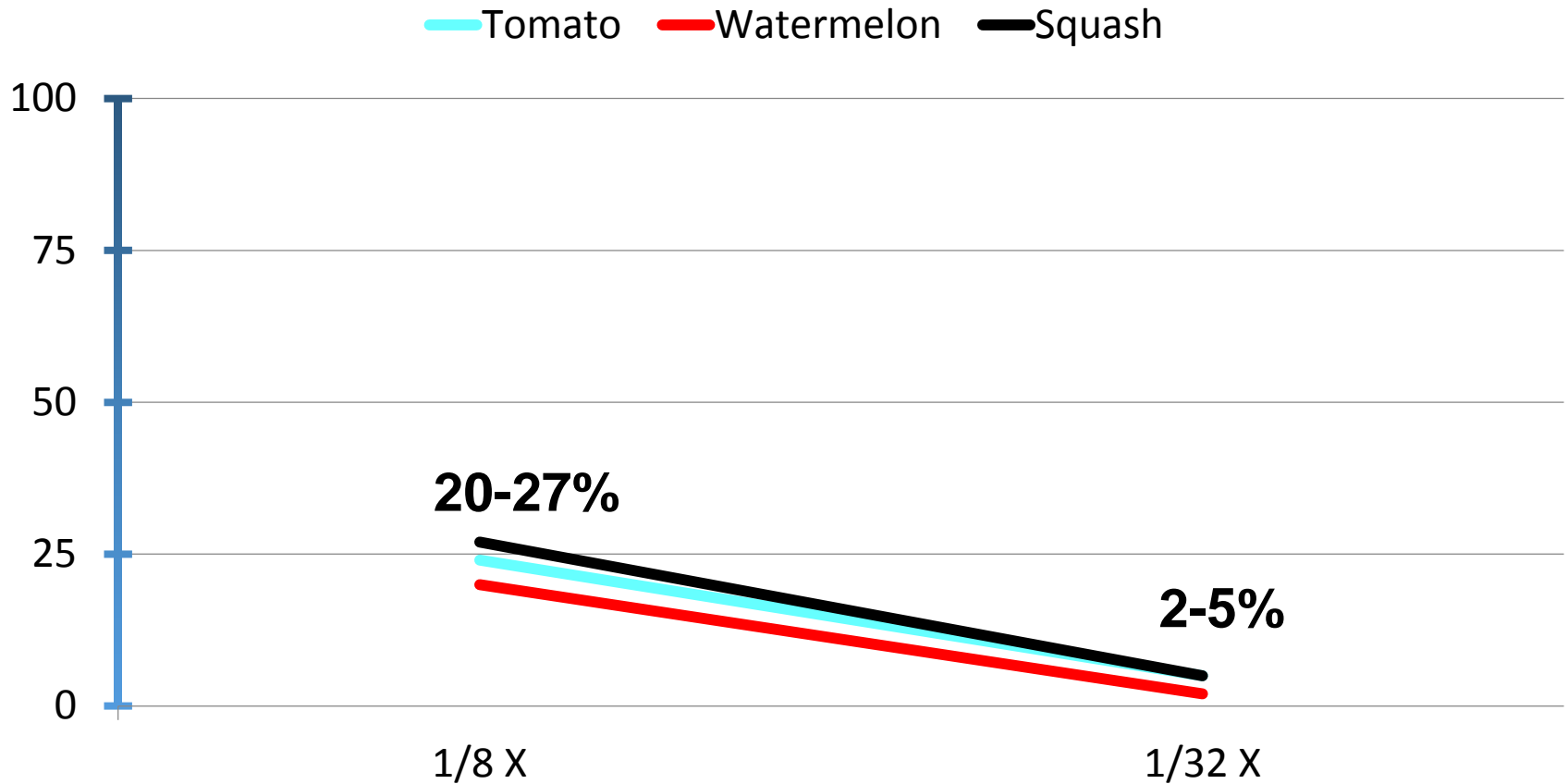
Results of The Dicamba

- **Fields were drifted on 1 to as much as 3 times in a 5 to 6 week window**
- **What about soybean yield???**
 - ❖ **Yield Loss hard to quantify**
 - ❖ **Most frequent report was 0**
 - ❖ **Some were in the 10% range**
 - ❖ **A few were 30 to 50%**

Why So Much Worse Than When RR Was Introduced?

- **There was no label so applicators were not trained**
- **Dicamba much more volatile than glyphosate**
- **Glyphosate most often at drift rates shows no injury on many broadleaf plants**

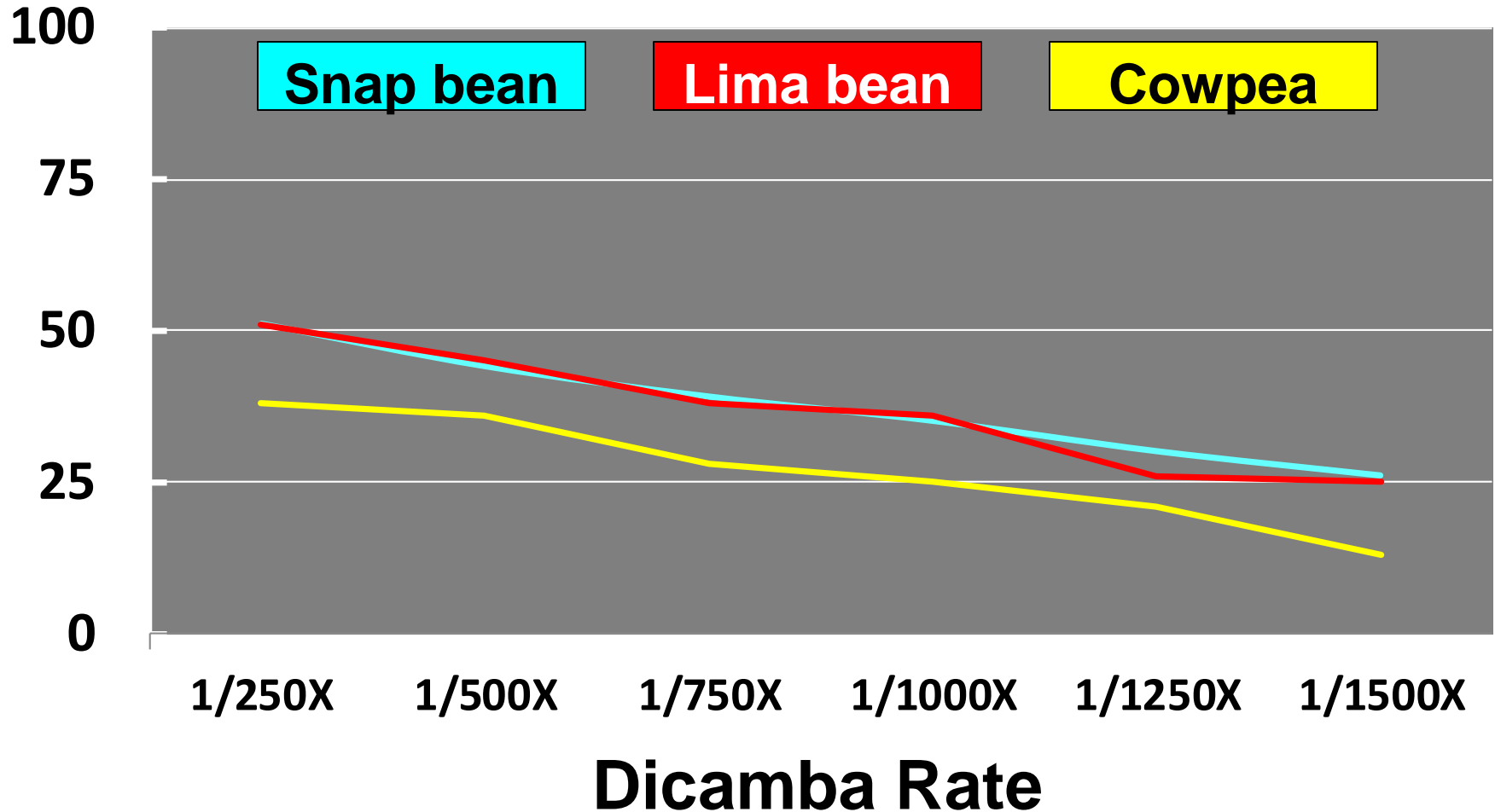
Visual Tomato, Melon, Squash Injury from Roundup



Yield loss occurred at 1/8X: Squash 56-64%, Tomato 28 to 41%. Veg 41, 2003.
Simulated drift study making applications broadcast at 15 GPA.

Maximum Visual Injury. 10 DAT, Tifton GA.

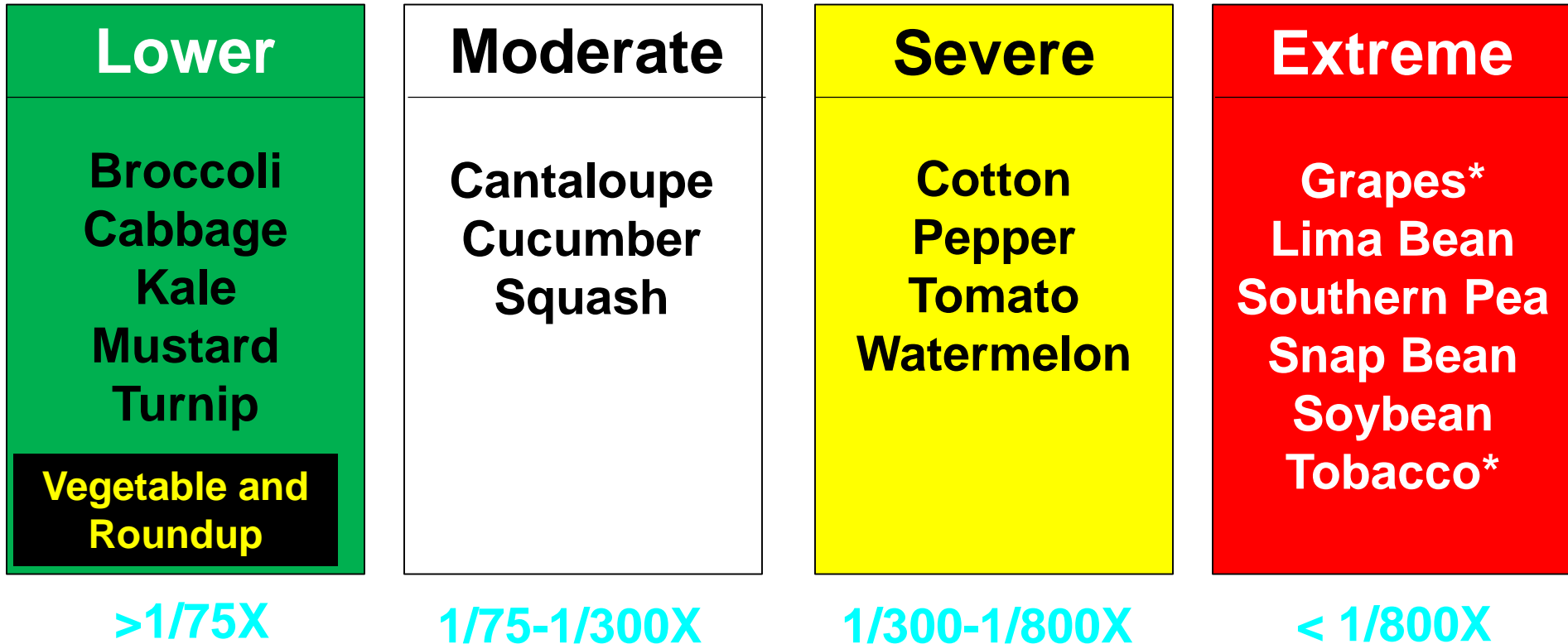
Percent Maximum Injury: (Epinasty and Stunting)





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Visual Sensitivity: Example Dicamba



Herbicide Rate of Detectable Injury

*Data from literature; all other data generated in GA field studies

EPA executes search warrants related to Dicamba

Saturday, October 22, 2016

Cody Tucker

Daily Dunklin Democrat

According to a news release obtained by the DDD Friday from the Environment Protection Agency, EPA has executed federal search warrants at several locations in southeastern Missouri as part of an investigation into alleged misuse or misapplication of herbicide products containing Dicamba. EPA's investigation is ongoing and several states in the Midwest and Southeast.

EDITION: UNITED STATES

REUTERS

Business Markets World Politics Tech Commentary Breakingviews Money Life

U.S. LEGAL NEWS | Tue Oct 25, 2016 | 6:33pm EDT

U.S. agency searches for proof of criminal use of herbicide dicamba



By Mark Weinraub | CHICAGO

The U.S. Environmental Protection Agency executed search warrants in parts of southeastern Missouri earlier this month to look for signs of improper use of the herbicide dicamba, the agency said on Tuesday.

The searches stemmed from complaints that dicamba, which has only been approved for application on fields before planting season or after harvest, damaged 41,000 acres (16,600 hectares) of soybeans and other crops. The complaints allege that improperly applied dicamba drifted into neighboring fields.

Dicamba can injure crops that are not resistant to dicamba, reducing final yields.

The warrants were executed the week of Oct. 10 at sites in Cape Girardeau, Dunklin, New Madrid and Stoddard counties as part of a criminal investigation, the EPA said. The agency did not specify what sites it searched.

Monsanto this year began selling a new dicamba-resistant soybean seed, Roundup Ready 2 Xtend, in the United States. Farmers have said that has led to an increase in the unapproved use of dicamba as growers planting those seeds can spray the herbicide without worrying about damage to their crops.

The EPA is expected to make a decision this autumn about whether to approve dicamba application on soybean fields that have already been planted, known as "over-the-top" application.

CROP TALK

N- Plot - Where it starts !

Good morning everybody - I decided this morning - well -- to goof off - lol So playing on the ... [\[More\]](#)

Author: **ECIN** Posted: 10-28-2016

Ecin, What do we do for corn hybrids??

We witnessed a wreck in corn this year. Nearly every trait claimed saw some failure and stalk deterioration was rapid. ...[\[More\]](#)

Author: **sw363535** Posted: 10-27-2016

EPA Chasing Dicamba Sprayers

How do we never learn? Soybeans that can tolerate dicamba were released last year, but the low-drift dicamba to apply on ...[\[More\]](#)

Author: **JimMeade** Posted: 10-26-2016

Ill Talk

Most Recent Poll

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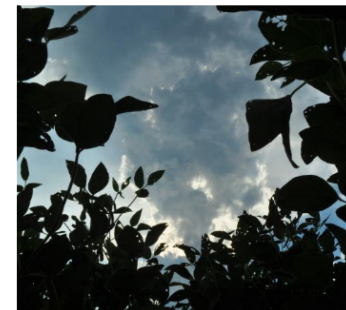
DICAMBA MOVEMENT PROMPTS ARKANSAS SHOOTING

ARGUMENT BETWEEN FARMERS RESULTS IN DEATH, SAYS AN ARKANSAS COUNTY SHERIFF.

By **Gil Gullickson** 10/28/2016

A dispute over over movement of dicamba herbicide has prompted a killing in Arkansas.

KAIT-TV news, a Jonesboro, Arkansas, ABC affiliate, reported that Mississippi County, Arkansas, Sheriff Dale Cook confirmed a Thursday shooting near Leachville, Arkansas. Cook said the shooting was due to an argument over dicamba drift. Sheriff Cook said Mike Wallace was shot to death following the argument with Allan Curtis Jones.



ST. LOUIS POST-DISPATCH News Sports Business Go! Life Buy/Sell

Law and order

Bootheel man arrested following fatal shooting allegedly sparked by dicamba dispute

By Bryce Gray St. Louis Post-Dispatch Oct 28, 2016 (2)

Proper Formulation

New products: critical to manage volatility

MONSANTO



Roundup Xtend™ or XtendiMax™

 **BASF**

The Chemical Company

Engenia

Proper Formulation

Lab work and small plot work results with new formulations are impressive.....BUT

What happens when we treat huge acres during the same time and in the same area????????????????



Xtend Stewardship

1. Nozzles TTI 04
2. Wind speed 3 to 10 mph
3. Boom height 24" above target
4. No tankmixes
5. 110' down wind buffer for 0.5 lbs
6. Xtendimax cannot be applied if rain is expected in the next 24 hours

Xtend Stewardship

1. Nozzle
2. Wind
3. Boom
4. No tar
5. 110' d
6. Xtend
expec



et

5 lbs

d if rain is
s

Xtend Stewardship

1. Xtend soybeans will not be a good fit in some fields..
 - Consider planting LL or RR in fields near sensitive crops
2. Better to mis-apply on one of your fields than drift on a neighbor...

A Few Crop Values

(Retail Value Per Acre 2016)

1. Soybean 2016 estimated injury: \$0 to \$350
2. Tobacco: \$10,000
3. Pepper (raised mulch): \$22,400
4. Tomato (raised mulch): \$33,600
5. Blueberry (high bush): \$10,000 (20K re-plant)
6. Pecan: \$3000
7. Tree and Shrub Nurseries: \$75,000

\$75,000 Mistake



Final Point

- **If drift is a big issue in 2017 dicamba will be a 1 year and done technology!!!**
- **Other pesticides also could get limited or pulled due to dicamba issue.... (atrazine, ALS herbicides, Neonics, etc)**

Questions?