Herbicide Application Timing: Effect on Weed Control Efficacy

Jason A. Bond

Delta Research and Extension Center Stoneville, MS

Phone: (662) 769-0268

E-mail: jason.bond@msstate.edu



MISSISSIPPI STATE UNIVERSITY

DELTA RESEARCH AND EXTENSION CENTER

Acknowledgment

- ADAMA USA
- AMVAC Chemical
- BASF Corporation
- Bayer CropScience
- Corteva Agrisciences
- FMC Corporation
- Gowan Company
- Horizon Ag



- Nichino USA
- Nutrien Ag Solutions
- Pinnacle Agriculture
- Riceco LLC
- Sipcam USA
- Syngenta Crop Protection
- United Phosphorus, Inc.
- Valent USA Corporation







2018 Weed Control Issues

- Weather!!
- Clethodim-resistant Italian ryegrass
- Off-target herbicide movement Clethodim, paraquat, glyphosate, Loyant, dicamba, 2,4-D
- Group 15 herbicide injury in soybean
- Poor grass control in all crops







2018 Weather

	Air TemperatureMaximumMinimum70487755							
	Maximum	Minimum						
April:								
2018	70	48						
10-yr average	77	55						
May:								
2018	90	67						
10-yr average	82	62						





Trimming Herbicide Costs

- Low commodity prices
- High input costs
- Effective weed control in 2017
- Injury from residual herbicides
- Other budgetary needs









Efficacy/Selection Pressure









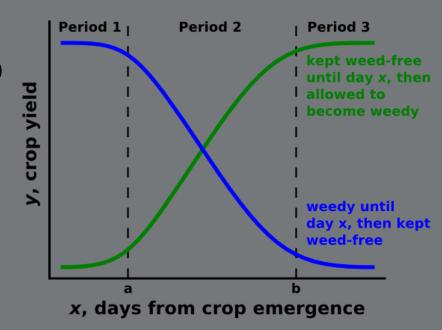




Crop-Weed Interactions

Critical Period of Weed Control:

- The period of time in which weed control is necessary to avoid significant yield loss.
- Varies with crop, weed species, weed density, weed emergence timing, and environmental factors.

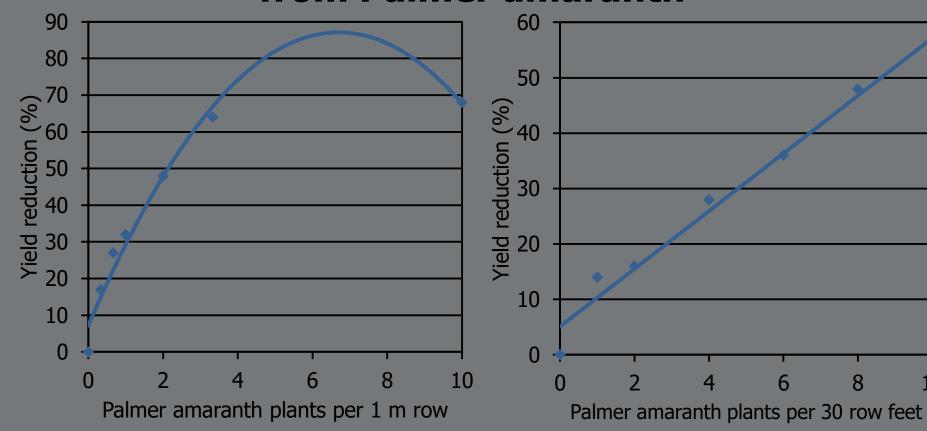


Source: Altieri 1995



Critical Period of Weed Control

Soybean and cotton yield loss due to interference from Palmer amaranth



Source: Klingaman and Oliver 1994



Source: Morgan et al. 2001

Soil Seedbank







Preplant/PRE Management











Preplant/PRE Management

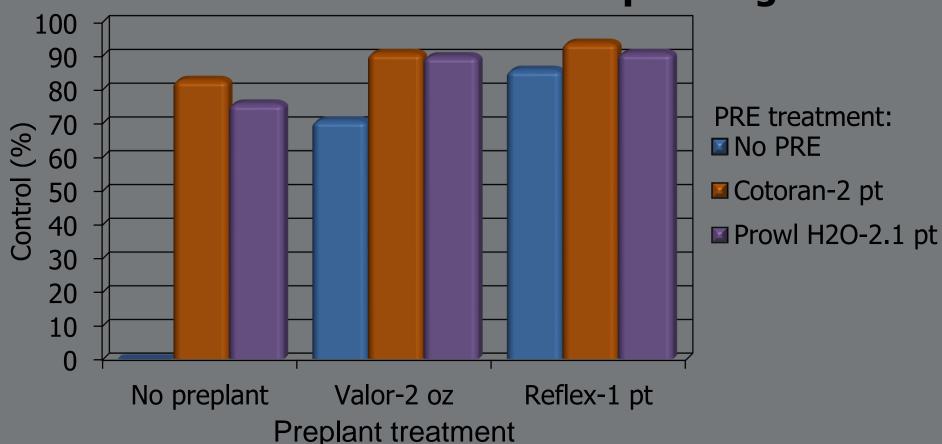






Preplant/PRE in Cotton

Palmer amaranth control with residual herbicides evaluated 2 weeks after planting







Preplant/PRE in Cotton









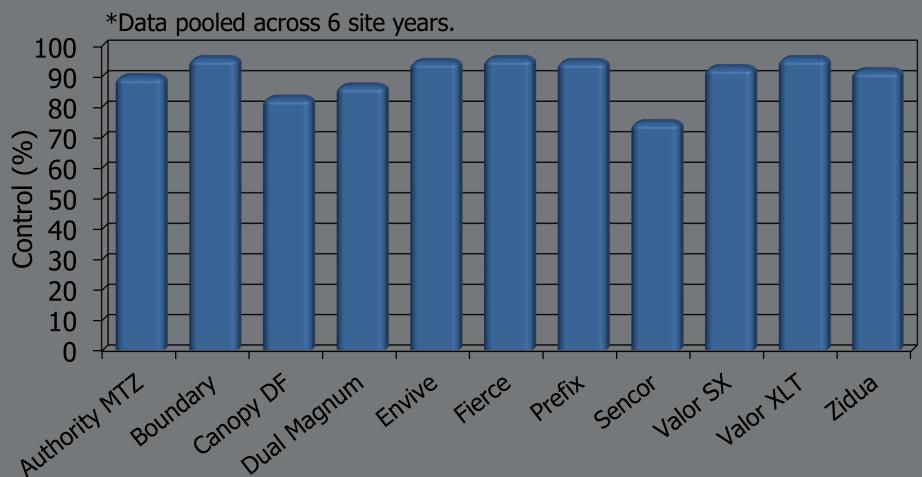
Reflex 10 d preplant fb Cotoran PRE





PRE in Soybean

Palmer amaranth control 28 DAT with residual herbicides applied at soybean planting







PRE in Soybean







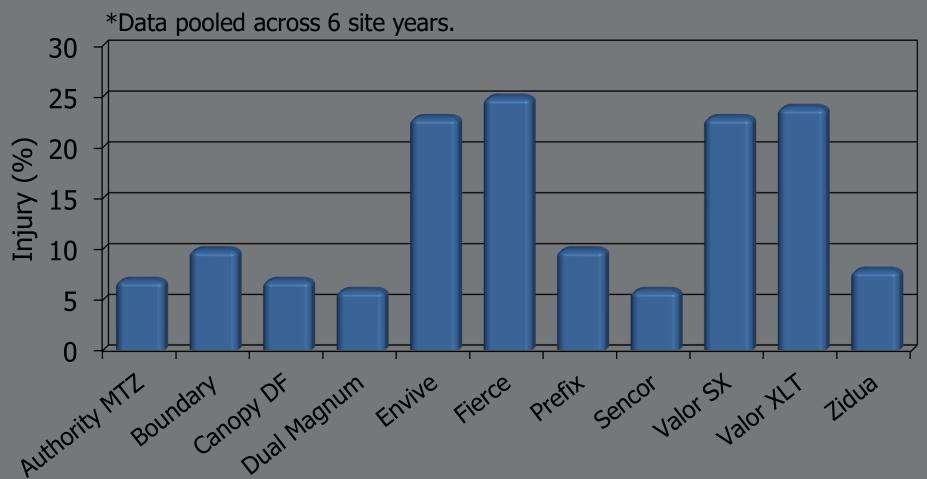






PRE in Soybean

Soybean injury 14 DAT with residual herbicides applied at planting







Group 15 Herbicide Injury

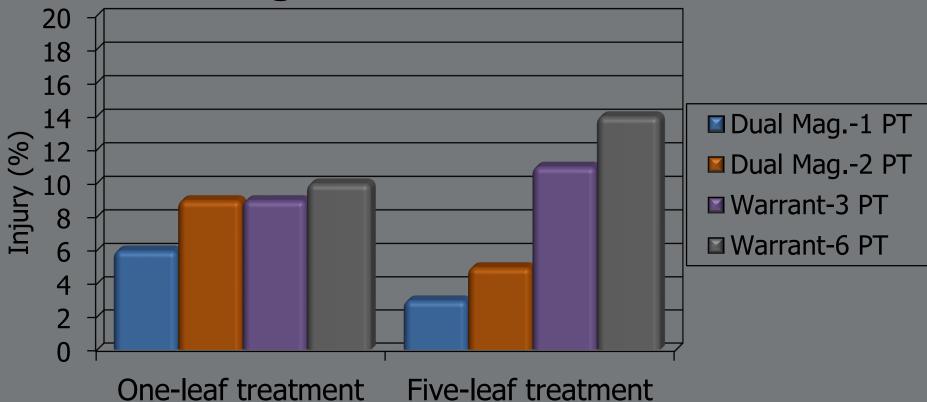






Group 15 Herbicide Injury

Cotton injury 7 days following applications of Dual Magnum and Warrant in cotton







Group 15 Herbicide Injury



Dual Magnum at 1 PT/A





Dual Magnum at 2 PT/A



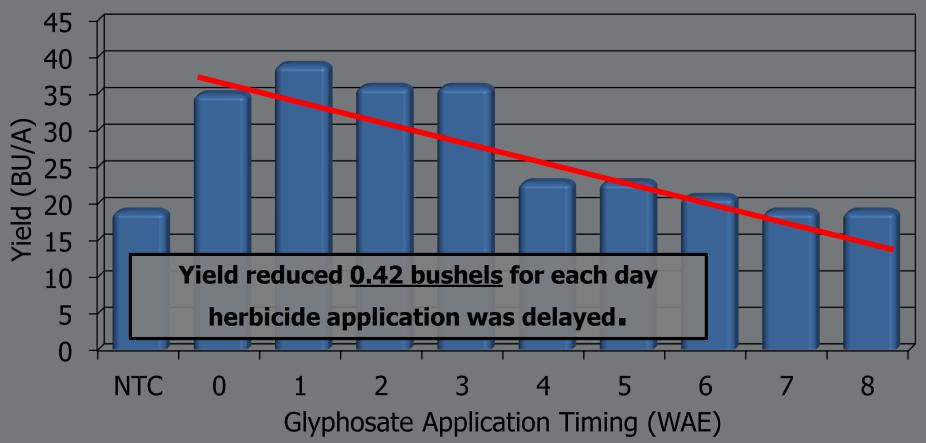
Warrant at 6 PT/A





POST Application Timing

Soybean yield following glyphosate at different application timings in Crowley, LA







POST Application Timing

Two applications of Liberty 280 at 29 OZ/A spaced 1 wk apart







Initiated 2 WAP

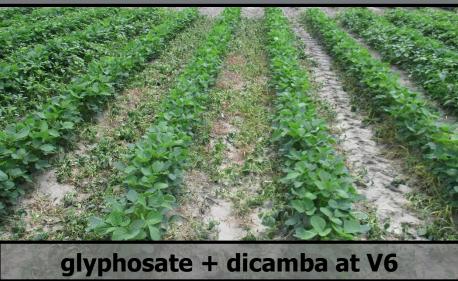
Initiated 3 WAP

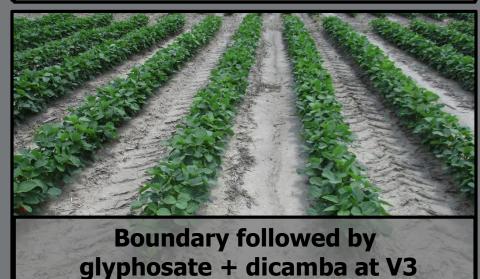
Initiated 4 WAP

POST Application Timing











Cost of Palmer Amaranth

Comparison of prices for herbicide programs targeting Palmer amaranth in 2007 and 2018

	2007		2018	
Timing	Treatment	Cost	Treatment	Cost
Burndown	Glyphosate + 2,4-D	\$10.56	Glyphosate + 2,4-D + Select Max + Valor SX	\$32.41
PRE	N/A	\$0.00	Paraquat + Boundary	\$29.62
Early-POST	Glyphosate + s-metolachlor	\$19.57	Glyphosate + Engenia + Zidua	\$36.92
Late-POST	Glyphosate	\$5.76	Glyphosate + s-metolachlor	\$19.57
Total		\$35.89		\$118.52

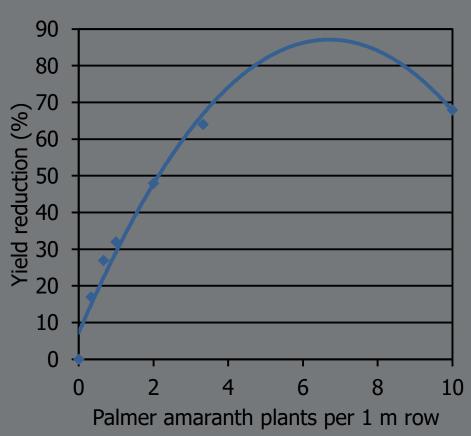
Note: All prices for 2007 and 2018 are from MSU-ES 2019 Soybean Planning Budget.





Cost of Palmer Amaranth

Soybean yield loss due to interference from Palmer amaranth



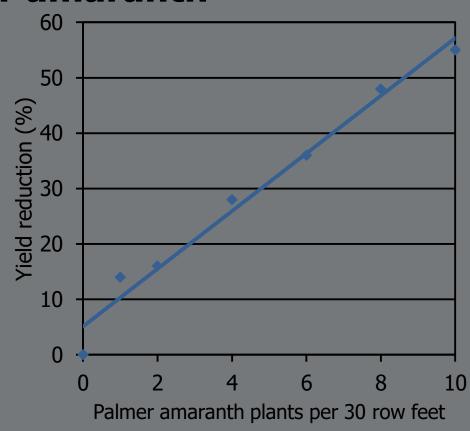
- 15% yield reduction
- 7.5 BU/A loss on
 50 BU/A crop
- \$64.50/A gross loss at \$8.60/BU soybean price



Cost of Palmer Amaranth

Cotton yield loss due to interference from Palmer amaranth

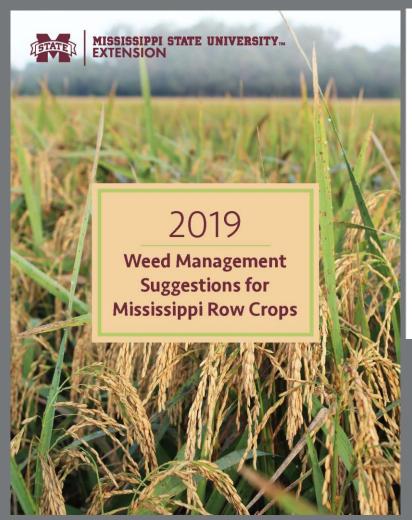
- 15% yield reduction
- 150 lb/A loss on
 1,000 lb/A crop
- \$114/A gross loss at \$0.76/lb cotton price







Weed Control in MS Row Crops



2019 Weed Management Suggestions for Mississippi Row Crops

Rainfast Intervals and Rotational Crop Restrictions

Many herbicides used in various crops have planting restrictions. When considering a rotational crop, the following table will help you choose the proper herbicide for the current year If a rotational crop is planted within the interval stated, or before the interval has expired, unacceptable injury to the rotational crop can occur. Consult individual product labels for

none

9 m

9 m

1-1.5 y

Herbicide	Rainfast Interv
2,4-D	6 h
2,4-DB	
Acifluorfen	4 h
Acuron ²	_
Aim	6-8 h
Alachlor	_
Anthem Flex ⁴	1 h
Anthem Maxx ⁴	1 h
Armezon Pro	1 h
Armezon/Impact	1 h
Atrazine ¹	_
Authority Elite	_
Authority First	_
Authority MTZ	_
Authority Supreme	_
Authortity XL-pH ≤ 7	_
Authortity XL-pH≥7	_
Axial XL	30 min
Axiom	_
Bentszon	4 h
Beyond	1h
Bolero	_
Boundary	_
Broadhead	6-8 h
Cadre	3 h
Callisto	
Canopy—pH ≤ 7	1h
Canopy—pH ≥ 7	1h
Canopy EX	2 h
Capreno	1 h
Classic	1 h
Clearpath	16
Clethodim	1 h
Clincher SF	2 h
Clomazone	_
Cobra	30 min
Convus	_
Dicamba ¹¹	4 h

2019 Weed Management Suggestions for Mississippi Row Crops

11 m-1.5 y

Burndown Weed Management

9 m

10 m

Weed Response Ratings for Herbicides Applied in Burndown Prior to Planting

				Winter weeds											_	Summer weed:																
	Herbicide group number	Crop ^{2,3}	Soil Activity	Annual bluegrass	Italian ryegrass	Bittercress	Buttercup	Carolina geranium	Chick weed	Curly dock (seedling)	Cultical evening-primrose	Henbit	Horseweed	Prickly lettuce	Shepherds-purse	Vetch	Virginia pepperweed	Bamyardgrass	Broadleaf signalgrass	Crabgrass	Goosegrass	Redrice	Seedling johnsongrass	Common ragweed	al	I	Morningglory—pitted	smallfower	Palmer amaranth Demostrania emartemed		Sicklened	Spurred anoda
2,4-D	4	C, CT, R, S	yes	0	0	8	9	7	8	7	9	3	8	9	8	6	9	0	0	0	0	0	0	-	8	9	9	9 :	8 8	8	8	9
Dicamba	4	C, CT, GS, SG, S	yes	0	0	8	9	8	8	9	9	7	9	9	8	9	9	0	0	0	0	0	0	9	9	9	9	9	8 8			
Fomesafen	14	CT, S	yes	0	0		-		-	-		-	3	-	-	-	-	4	3	4	4	2	4	7	4	5	7	6	9 7	8	7	1
Glufosinate	10	C, CT, S	по	6	7	-	-	8	9	6	7	6	9	-	-	8	9	8	8	8	5	-	9	-	8	9	9	9	8 8	7	7	-
Glyphosate	9	C, CT, GS, P, R, SG, S	no	9	5	9	9	7	9	6	6	7	5	8	9	5	8	9	9	9	8	8	9	9	6	7	8	8	5 7	7	8	5
Glyphosate + 2,4-D	9, 4	C, CT, R, S	yes	9	5	9	9	9	9	8	9	8	9	9	9	6	9	9	9	9	8	8	9	9	8	9	8	8 !	9 8	9		
Glyphosate + Aim	9, 14	C, CT, GS, P, R, SG, S	110	9	5	9	9	8	9	8	7	7	5	8	9	5	9	9	9	9	8	8	9	9	9	9	9	8	8 9	7	8	8
Glyphosate + Canopy EX	9, 2, 2	S	yes	9	5	9	8	7	8	8	7	8	7	-	8	8	-	9	9	9	8	8	9	9	8	8	9	9	5 7	8	8	8
Glyphosate + clomazone	9, 13	R, S	yes	9	5	9	9	7	9	6	6	7	5	8	9	5	8	9	9	9	8	8	9	9	6	7	8	8	5 7	7	8	5
Glyphosate + clomazone + Sharpen	9, 13, 14	R, S	yes	9	5	9	9	7	9	9	7	7	8	9	9	5	8	9	9	9	8	8	9	9	9	8	9	9 !	9 8	7	8	
Glyphosate + dicamba	9, 4	C, CT, GS, SG, S	yes	9	5	9	9	9	9	9	8	8	9	9	9	9	9	9	9	9	8	8	9	9	8	9	8	8	9 8	9	9	9
Glyphosate + dicamba + 2,4-D	9, 4, 4	C, CT, S	yes	9	5	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8	8	9	9	8	9	8	8 !	9 8	9	9	9
Glyphosate + Envive	9, 2, 2, 14	S	yes	9	6	9	9	8	9	-	8	9	9	-	9	-	-	9	9	9	8	8	9	9	-	8	8	8	9 9	-	8	
Glyphosate + Fierce	9, 14, 15	C, S	yes	9	6	9	9	8	9	-	8	9	8	-	9	-	-	9	9	9	8	8	9	9	-	8	8	8	9 9	-	8	
Glyphosate + Firstshot SG	9, 2, 2	C, CT, GS, R, SG, S	yes	9	5	9	9	8	9	9	7	8	5	9	9	9	9	9	9	9	9	8	9	6	7	8	9	9	5 9	7	8	6
Glyphosate + flumioxazin	9, 14	C, CT, GS, P, R, S	yes	9	5	9	9	8	9	-	8	9	8	-	9	-	-	9	9	9	8	8	9	9	7	8	8	8	9 9	-	8	
Glyphosate + Goal 2XL	9, 14	CT, S	yes	9	5	9	9	8	9	7	7	9	8	-	9	7	9	9	9	9	8	-	9	-	7	8	8	8	9 7	7	8	1.
Glyphosate + LeadOff	9, 2, 2	C, CT, P, S	yes	9	6	7	9	9	9	9	6	7	7	-	9	-	-	9	9	9	8	-	9	-	7	8	8	8 !	9 7	7		
Glyphosate + metolachlor/S-metolachlor	9, 15	C, CT, GS, P, S	yes	9	5	9	9	7	9	6	6	7	5	8	9	5	8	9	9	9	8	8	9	9	6	7	8	8	5 7	7	8	5
Glyphosate + Sharpen	9, 14	C, CT, GS, R, SG, S	yes	9	6	9	9	7	9	9	7	7	8	9	9	5	8	9	9			8	9			8	9	9 !	9 8	7	8	6
Glyphosate + Synchrony XP	9, 2, 2	S	yes	9	5	9	9	7	9	8	7	7	7	9	9	5	8	9	9	9	8	8	9	9	7	8	8	8	5 9	7	7	1
Glyphosate + Verdict	9, 14, 15	C, GS, S	yes	9	6	9	9	7	9	9	7	7	8	9	9	5	8	9	7	9	8	8	9	9	9	8	9	9 !	9 8	7	-	6
Metribuzin	5	S	yes	9	6	9	9	7	9	-	6	8	5	8	9	6	6	6	6	6	6	3	6	8	9	7	7	7	8 8	8	7	8
Paraquat	22	C, CT, GS, P, R, SG, S	по	9	8	9	9	7	9	4	7	9	6		9	8	7	8	8	8	8			8	8	8	8	7 !	9 6			
Paraquat + 2,4-D	22, 4	C, CT, R, S	yes	9	8	9	9	7	9	7	8	9	8	-	9	8	8	8	8	8	8	7	8	8	8	8	8	8	9 8	8	9	8
Paraquat + atrazine	22, 5	C, GS	yes	9	8	9	9	8	9	-	8	9	9	8	9	8	8	8	8			7	8			8	8	8 !	9 8	8		
Paraquat + diuron	22, 5	CT	yes	9	8	9	9	8	9	-	8	9	9		9			8	8	8	8	7	8	8	8	8	8	8	9 8	8	9	8
Paraquat + Goal 2XL	22, 14	CT, S	yes	9	8	9	9	9	9	5	7	9	6		9		7	-	- [- [- [- [- [- [- [- 1	-		- 7	-	-	1-
Paraquat + metribuzin	22, 5	S	yes	9	8	9	9	8	9	-	8	9		8	9	8	8	8	8	8	8	7	8	8	8	8	8	8 !	9 8	8		
Paraquat + prometryn	22, 5	CT	yes	9	8	9	9	7	9		7	9	9	8	9	8	7	8	8	8	8	7	8	8	8	8	8	8	9 8	8	9	8

Rating Scale: 0.3 = mone to slight: 4.6 = fair, 7.8 = good; 9.10 = excellent.
Control exceeded under optimize conditions. Mississippi State University does not guarantee these estimates since many factors cause herbicide performance to vary. Resistance to recommended use rates of some herbicides has been identify.

fied in certain weed species in Mississippi.

A special record of the species of Mississippi.

Son Patrick and Comp Patrictions for additional information about labeling for each comp.

http://extension.msstate.edu/sites/default/files/publications/publications/p3171.pdf





Contact Information

Jason A. Bond

Delta Research and Extension Center Stoneville, MS Phone: (662) 769-0268

E-mail: jason.bond@msstate.edu www.mississippi-crops.com Follow on Twitter @JasonABond