

Axant Cotton and Weed Control Issues

DONNIE MILLER
NORTHEAST RES. STATION





Stoneville[®]
Cotton

with

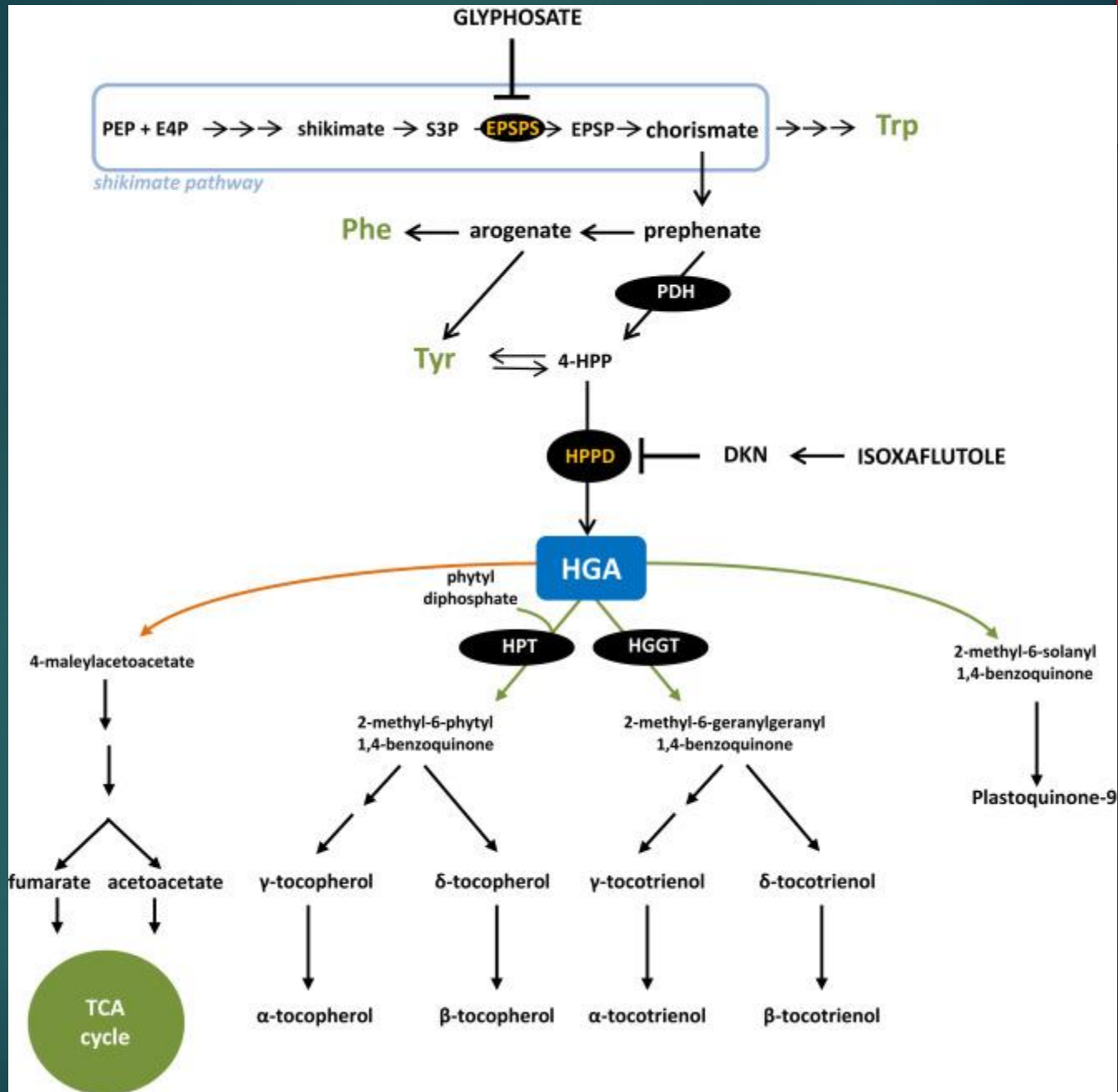
Axant[™] Flex by BASF
Herbicide Trait Technology

Always read and follow label directions.
Alite 27 and Engenia herbicides are US EPA Restricted-Use Pesticides.

Alite[™] 27 herbicide (EPA Reg. No. 7969-433) is not registered for use on isoxaflutole-resistant cotton nor available for sale for such use. Information on using Alite 27 herbicide on isoxaflutole-resistant cotton is provided for educational purposes only and is not intended to promote the sale of this product. Any sale of Alite 27 herbicide after registration is obtained for use on isoxaflutole-resistant cotton shall be based solely on the EPA-approved product label, and any claims regarding product safety and efficacy shall be addressed solely by the label. Alite 27 herbicide is currently not available for sale.

Alite 27 Herbicide

Isoxaflutole is a pigment inhibitor. It works by preventing the biosynthesis of carotenoid pigments, which protect chlorophyll from decomposition by sunlight. Without carotenoid pigments, chlorophyll pigments are photo-oxidized and chloroplasts break down. Without the energy collecting action of the chlorophyll, the whole plant eventually dies.





Characteristics of Isoxaflutole

Alite 27

Water Solubility ppm:

Atrazine (33)
Balance Flexx - (6.8)
Banvel/Clarity (4500)
Dual Magnum (530)
Prowl H2O (<1)
Warrant (223)

Degradation:

Primarily hydrolysis with microbial

Soil adsorption:

Atrazine (strong)
Balance Flexx (strong)
Banvel/Clarity (weak)
Dual Magnum (strong)
Prowl H2O very (strong)
Warrant (moderate)

RESTRICTED USE PESTICIDE

May injure phytonoxia susceptible non-target plants.
For retail sale to and use only by certified applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification. Commercial and certified applicators must ensure that all persons involved in these activities are informed of the precautionary statements.



Balance flexx Herbicide

Net Contents:

2.5 Gallons



For: Weed control in field corn, seed corn and corn grown for silage in the states of: AR, AL, CO, DE, GA, IL, IN, IA, KS, KY, LA, MI, MN, MO, MS, MT, NE, NJ, NY, ND, OH, OK, PA, SC, SD, TN, TX, VA, WI, WV, and NY.
In the states of CO, KS, and MO use is only allowed under 24c registrations. A current 24c label must be in the possession of the user at the time of the pesticide application.
In the state of MN use is only allowed in accordance with the Minnesota Product Bulletin.
In the state of WI use is only allowed in accordance with the Wisconsin Product Bulletin.

ACTIVE INGREDIENT: metolachlor (2-propenyl) 4-(2-methylbutyl)-4-thioxoimidazolidinone isomer 25.00%
OTHER INGREDIENTS: 75.00%
Contains 2.00 pounds active ingredient per U.S. gallon TOTAL 100.00%

EPA Reg. No. 269-106F

KEEP OUT OF REACH OF CHILDREN CAUTION

For MEDICAL and TRANSPORTATION Emergencies ONLY Call 24 Hours a Day 1-800-874-7577
For PRODUCT USE Information Call 1-800-888-BAYER (1-800-888-2867)

See additional precautionary statements and directions for use on label.

Produced for:
Bayer CropScience LP
900 N. Lindbergh Blvd.
St. Louis, MO 63167

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SOYBEAN PERFORMANCE SYSTEM

Balance™



Balance Bean Herbicide

- Excellent pigweed control
- Very good grass control
- Good morningglory and sesbania control
- Good initial sicklepod and johnsongrass control that lessened quicker than other weeds evaluated
- Benefitted from addition of metribuzin or grass residual long term



Weed Control in Axant Cotton

Palmer Amaranth 28 and 42 DAT

Treatment	Rate	Halfway, TX		Marianna, AR		Bixby, OK		College Station, TX		Ideal, GA		Jackson, TN		Dundee, MS	
		28 DAT ^c	42 DAT	28 DAT	42 DAT	28 DAT	42 DAT	28 DAT	42 DAT	28 DAT	42 DAT	28 DAT	42 DAT	28 DAT	42 DAT
	kg ai ha ⁻¹	%													
Isoxaflutole	0.11	99	93	98	91 ab	82 c	31 f	82 b	79 bc	61 f	64 f	76	25 ab	73	26 b
IFT + acetochlor	0.11 + 1.26	100	98	99	89 ab	99 a	75 abc	99 ab	96 ab	95 ab	97 a	92	43 ab	92	55 ab
IFT + acetochlor	0.11 + 0.63	100	97	97	94 ab	95 ab	70 a-d	100 a	97 ab	91 a-d	96 a	89	45 ab	89	44 ab
IFT + diuron	0.11 + 1.12	99	96	97	91 ab	99 a	79 ab	99 ab	98 a	95 ab	99 a	87	43 ab	95	53 ab
IFT + diuron	0.11 + 0.56	100	96	98	91 ab	97 a	70 a-d	99 ab	98 a	90 a-d	91 ab	86	30 ab	91	64 a
IFT + fluometuron	0.11 + 1.12	99	96	99	94 ab	95 ab	64 a-d	96 ab	82 abc	83 a-e	80 b-e	81	30 ab	92	61 a
IFT + fluometuron	0.11 + 0.56	100	96	99	95 ab	95 ab	48 c-f	100 a	96 ab	72 def	67 ef	83	28 ab	92	44 ab
IFT + fluridone	0.11 + 0.17	98	96	99	97 a	98 a	71 a-d	100 a	100 a	96 a	98 a	87	50 ab	95	56 ab
IFT + fluridone	0.11 + 0.08	99	94	97	91 ab	96 ab	61 a-e	99 ab	96 ab	92 abc	92 ab	75	28 ab	90	49 ab
IFT + fomesafen	0.11 + 0.28	99	98	99	96 ab	97 a	74 abc	99 ab	94 ab	97 a	96 a	93	57 a	89	64 a
IFT + fomesafen	0.11 + 0.14	100	98	99	93 ab	94 ab	66 a-d	88 ab	75 c	90 a-d	79 b-f	87	36 ab	91	59 ab
IFT + pendimethalin	0.11 + 1.12	98	94	98	94 ab	94 ab	55 a-f	98 ab	89 abc	90 a-d	92 ab	88	36 ab	91	53 ab
IFT + pendimethalin	0.11 + 0.56	100	94	98	89 ab	84 c	33 f	100 a	93 abc	75 b-f	80 b-e	80	33 ab	93	46 ab
IFT + prometryn	0.11 + 1.35	98	93	98	94 ab	99 a	80 a	100 a	97 ab	79 a-f	87 abc	79	21 b	91	37 ab
IFT + prometryn	0.11 + 0.67	97	92	98	92 ab	95 ab	52 b-f	96 ab	88 abc	67 ef	74 c-f	80	24 ab	87	49 ab
IFT + pyriithiobac	0.11 + 0.058	100	98	97	91 ab	87 bc	45 def	99 ab	84 abc	73 c-f	75 c-f	82	33 ab	73	36 ab
IFT + pyriithiobac	0.11 + 0.029	99	99	94	85 b	83 c	35 ef	99 ab	89 abc	73 c-f	71 def	80	34 ab	90	45 ab
IFT + S-metolachlor	0.11 + 1.4	100	99	95	91 ab	99 a	71 a-d	99 ab	99 a	93 ab	96 a	81	33 ab	91	62 a
IFT + S-metolachlor	0.11 + 0.7	100	97	99	93 ab	96 ab	66 a-d	99 ab	94 ab	87 a-e	86 a-d	84	35 ab	90	45 ab
P values		0.3723	0.0055	0.3774	0.083	<0.0001	<0.0001	0.0383	<0.0001	<0.0001	<0.0001	0.0392	0.0428	0.0623	0.0039

^aAbbreviations: DAT, d after treatment; IFT, isoxaflutole.

^bPalmer amaranth control was combined across 2019 and 2020 at all locations.

^cTreatment means within a column followed by the same or no letter do not statistically differ according to Tukey's HSD test at $\alpha = 0.05$.

Weed Control in Axant Cotton

Large Crabgrass 28 and 42 DAT

Treatment	Rate	Marianna, AR		Ideal, GA		Bixby, OK	
		28 DAT ^c	42 DAT	28 DAT	42 DAT	28 DAT	42 DAT
	kg ai ha ⁻¹	%					
Isoxaflutole	0.11	81 ab	75	77 f	76 f	90 ab	55 cd
IFT + acetochlor	0.11 + 1.26	93 ab	81	92 a-d	95 abc	90 ab	59 a-d
IFT + acetochlor	0.11 + 0.63	84 ab	75	87 a-f	93 a-d	89 ab	57 cd
IFT + diuron	0.11 + 1.12	88 ab	81	96 a	96 abc	98 a	83 ab
IFT + diuron	0.11 + 0.56	90 ab	86	90 a-f	91 a-e	97 a	64 a-d
IFT + fluometuron	0.11 + 1.12	91 ab	86	89 a-f	88 b-e	96 a	70 abc
IFT + fluometuron	0.11 + 0.56	96 a	87	83 b-f	82 ef	97 a	65 a-d
IFT + fluridone	0.11 + 0.17	93 ab	86	95 ab	97 ab	97 a	68 a-d
IFT + fluridone	0.11 + 0.08	90 ab	87	91 a-e	90 a-e	95 a	58 bcd
IFT + fomesafen	0.11 + 0.28	88 ab	84	91 a-e	96 abc	88 ab	53 cd
IFT + fomesafen	0.11 + 0.14	83 ab	74	78 ef	86 c-f	84 ab	52 cd
IFT + pendimethalin	0.11 + 1.12	95 a	91	94 abc	98 a	95 a	65 a-d
IFT + pendimethalin	0.11 + 0.56	85 ab	77	90 a-f	94 a-d	91 ab	55 cd
IFT + prometryn	0.11 + 1.35	89 ab	85	94 abc	94 a-d	97 a	82 ab
IFT + prometryn	0.11 + 0.67	86 ab	83	85 a-f	86 c-f	97 a	54 cd
IFT + pyrithiobac	0.11 + 0.058	78 b	71	78 ef	82 ef	79 b	61 a-d
IFT + pyrithiobac	0.11 + 0.029	86 ab	75	79 def	82 ef	79 b	45 d
IFT + S-metolachlor	0.11 + 1.4	91 ab	86	97 a	97 abc	99 b	84 a
IFT + S-metolachlor	0.11 + 0.7	93 ab	83	82 c-f	84 def	97 a	66 a-d
P values		0.0044	0.4108	<0.0001	<0.0001	<0.0001	<0.0001

^aAbbreviations: DAT, d after treatment; IFT, isoxaflutole.

^bLarge crabgrass control was combined across 2019 and 2020 at all locations except for Marianna, AR, where large crabgrass was only present in 2019.

^cTreatment means within a column followed by the same or no letter do not statistically differ according to Tukey's HSD test at $\alpha = 0.05$.

Weed Control in Axant Cotton

Morningglory 21 to 42 DAT

Treatment	Rate	Marianna, AR		Bixby, OK		College Station, TX		Jackson, TN	
		28 DAT ^c	42 DAT	28 DAT	42 DAT	28 DAT	42 DAT	21 DAT	35 DAT
	kg ai ha ⁻¹	%							
Isoxaflutole	0.11	50 b	18	76	66 a-d	80 ab	81 ab	89	77
IFT + acetochlor	0.11 + 1.26	61 ab	5	83	68 a-d	54 b	68 abc	81	66
IFT + acetochlor	0.11 + 0.63	66 ab	11	76	67 a-d	53 b	70 abc	80	60
IFT + diuron	0.11 + 1.12	88 a	40	94	89 a	83 ab	89 a	99	79
IFT + diuron	0.11 + 0.56	81 ab	34	91	83 abc	74 ab	84 a	89	65
IFT + fluometuron	0.11 + 1.12	76 ab	26	87	79 a-d	80 ab	82 ab	99	72
IFT + fluometuron	0.11 + 0.56	74 ab	35	87	68 a-d	80 ab	80 ab	92	63
IFT + fluridone	0.11 + 0.17	85 a	49	84	80 a-d	94 a	94 a	94	62
IFT + fluridone	0.11 + 0.08	70 ab	19	78	76 a-d	75 ab	83 a	80	71
IFT + fomesafen	0.11 + 0.28	71 ab	31	80	74 a-d	58 ab	45 c	87	71
IFT + fomesafen	0.11 + 0.14	61 ab	14	79	64 a-d	55 ab	53 bc	93	69
IFT + pendimethalin	0.11 + 1.12	66 ab	36	83	73 a-d	62 ab	67 abc	89	84
IFT + pendimethalin	0.11 + 0.56	63 ab	14	71	49 d	70 ab	80 ab	99	73
IFT + prometryn	0.11 + 1.35	75 ab	14	90	88 ab	73 ab	85 a	96	64
IFT + prometryn	0.11 + 0.67	74 ab	23	89	80 a-d	78 ab	74 abc	89	68
IFT + pyrithiobac	0.11 + 0.058	74 ab	11	95	75 a-d	63 ab	83 a	86	68
IFT + pyrithiobac	0.11 + 0.029	65 ab	8	80	61 a-d	66 ab	77 ab	99	73
IFT + S-metolachlor	0.11 + 1.4	59 ab	6	71	57 bcd	68 ab	81 ab	93	67
IFT + S-metolachlor	0.11 + 0.7	59 ab	13	66	56 cd	68 ab	78 ab	84	63
P values		0.0035	0.1986	0.0285	0.0001	0.0115	<0.0001	0.7616	0.9784

^aAbbreviations: DAT, d after treatment; IFT, isoxaflutole.

^bMorningglory control was combined across 2019 and 2020 at all locations except for Marianna, AR, and Jackson, TN, where morningglory was only present in 2020.

^cTreatment means within a column followed by the same or no letter do not statistically differ according to Tukey's HSD test at $\alpha = 0.05$.

Overall Beltwide Conclusions

- diuron, s-metolachlor, and fluoridone consistently performed well as tank mix partners
- overall weed control decreased more rapidly with higher rainfall/irrigation
- allows incorporation of a unique mode/mechanism of action to aid in resistance management



Palmer Amaranth Control on June 22, 2021 (27 DAT)



Untreated Check



Alite 27 Herbicide @ 3 fl
oz/A¹ + Direx Herbicide
@ 24 fl oz/A

Trial location Oklahoma State University,
Altus, OK, 2021, conducted by Dr. Todd
Baughman

Prickly Sida and Barnyardgrass Control on 6/22/2022 (31 DAT)

Trial location LSU AgCenter Northeast
Research Station



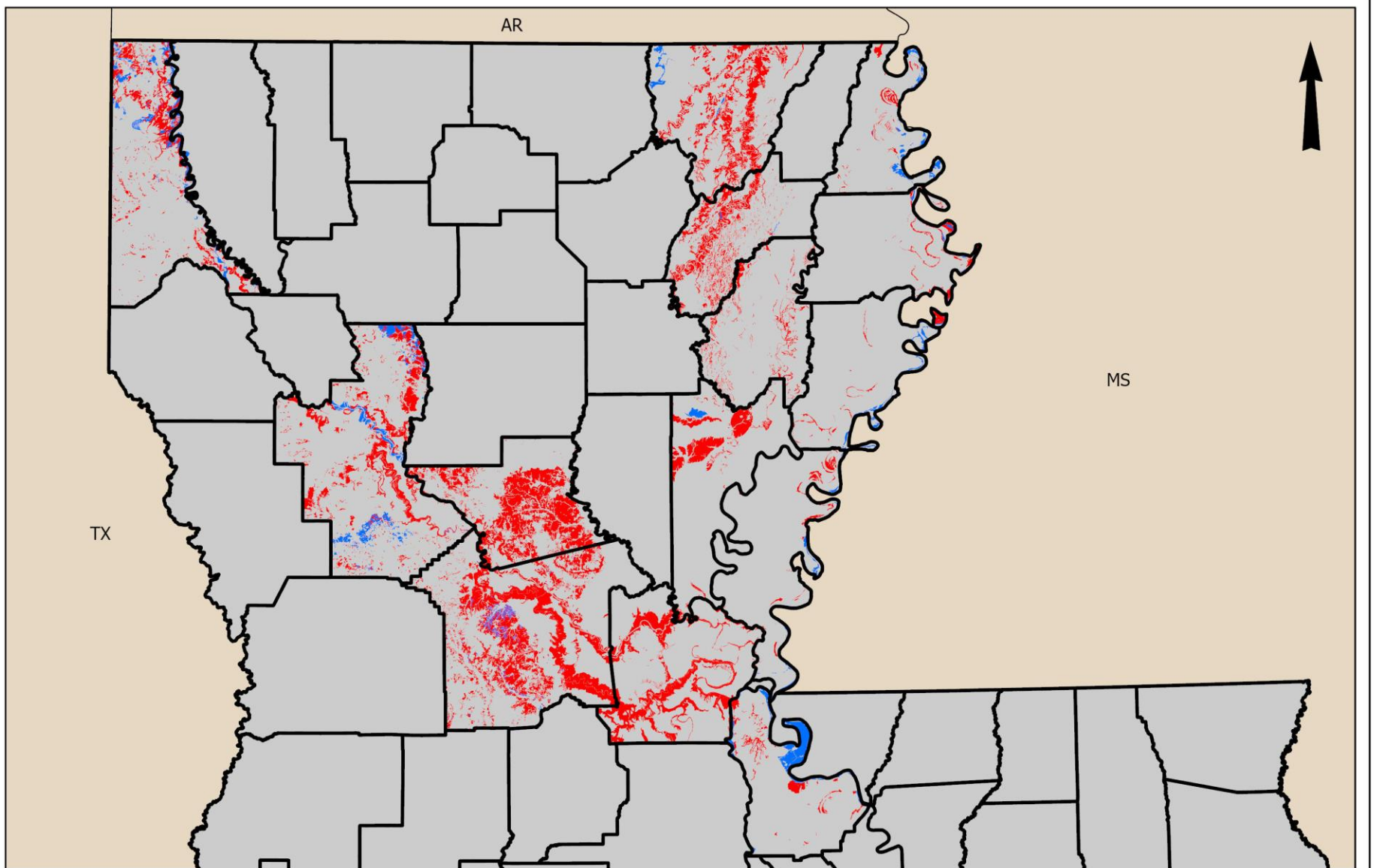
Untreated Check



Alite™ 27
Herbicide

Diuron and Fluometuron Future

- ▶ All pesticides in US registered by EPA
- ▶ Under FIFRA reviewed every 15 yrs
- ▶ Endangered Species Act and Endocrine Disruptor Screening Program
- ▶ Both in PID (Proposed Interim Decision Phase)
- ▶ Identified potential cancer risks from food and drinking water exposure and residential handler paint exposure
- ▶ EPA cannot make an aggregate safety finding for diuron
- ▶ PID for diuron proposes termination of nearly all conventional uses (including all food/feed uses and conventional herbicide use) and proposed reduction rate for all paints and building material products.
- ▶ PID for fluometuron proposes to eliminate use of soils that are hydrologic groups A and B, which are less than 20% clay content.






AR

MS

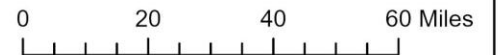
TX

HSG

-  A & A/D
-  B & B/D
-  Parish Boundary

Hydrologic Soil Group (HSG) Cotton Acreage Louisiana

HSG Source: USDA-NRCS





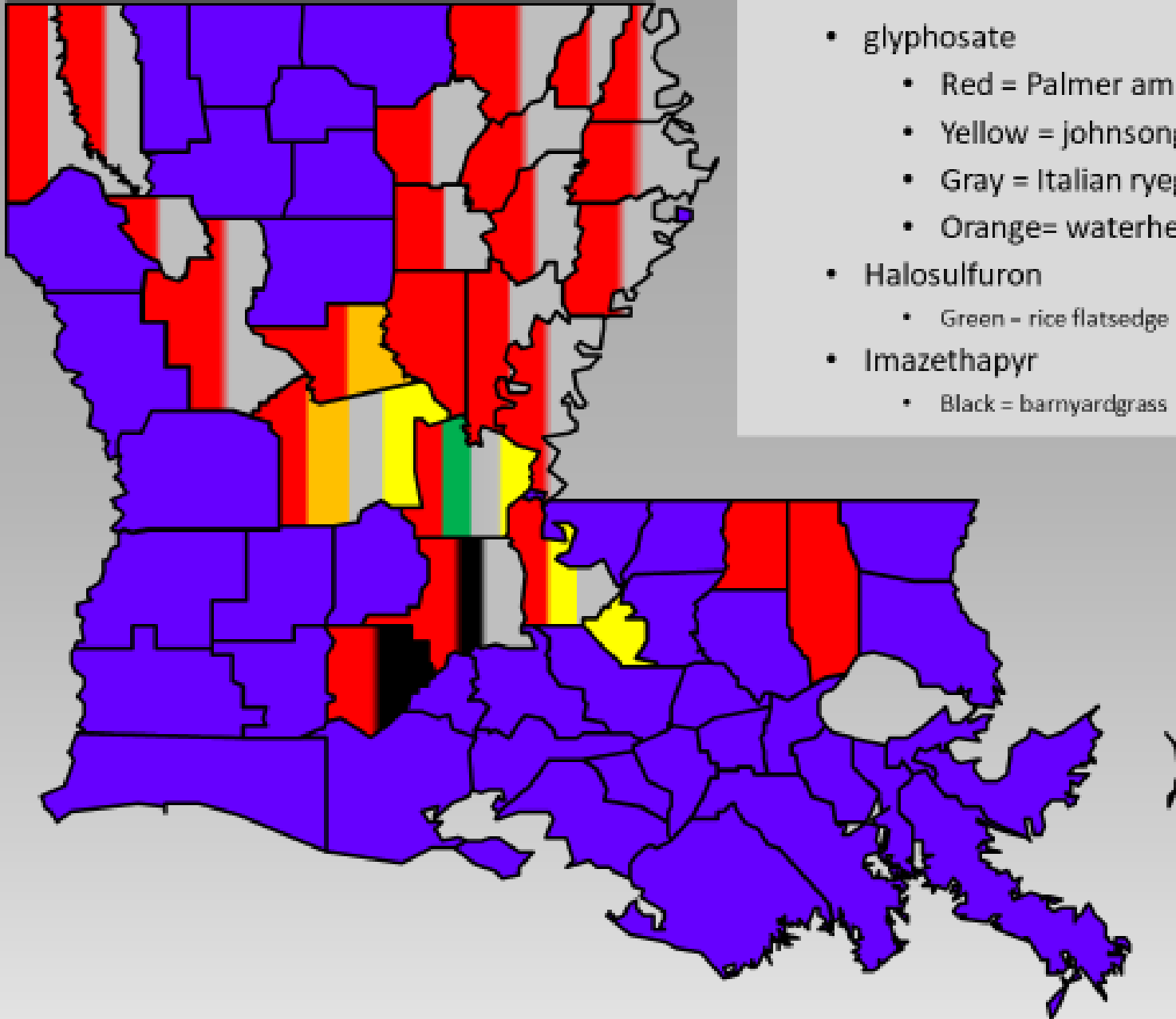
Annual Grass Control

- ▶ 2020 MSU reported 7-15% increase in control of signalgrass and ryegrass when clethodim and glyphosate were not allowed to mix with 2,4-D/dicamba (chemical interaction?)
- ▶ 2020 Purdue reported antagonism on volunteer corn with 2,4-D and clethodim requiring separate applications
- ▶ 2020 LSU AgCenter research indicated a 20 percentage point reduction of barnyardgrass control with dicamba and glyphosate
- ▶ 2020 Tennessee reported a 30 percentage point reduction in junglerice control with dicamba and glyphosate (auxins and actively growing plant?)
- ▶ Grass size, environmental conditions, rates, resistance



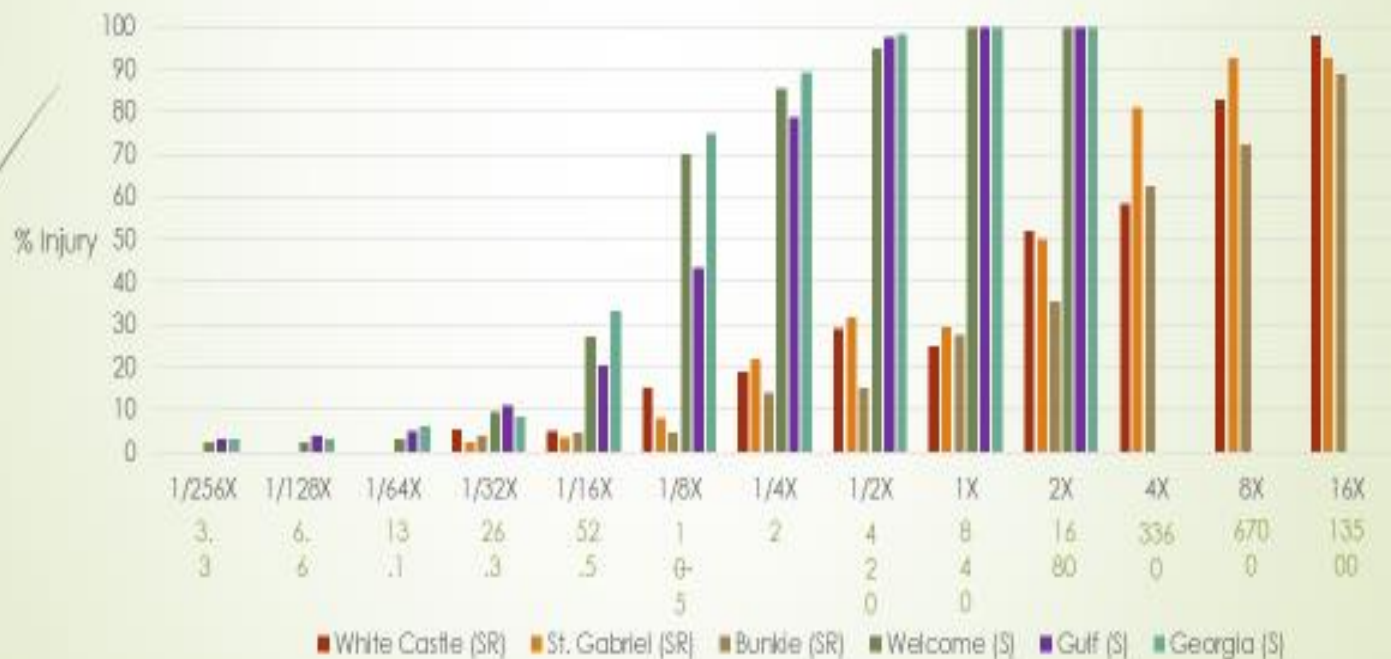
Confirmed Herbicide Resistance

- glyphosate
 - Red = Palmer amaranth
 - Yellow = johnsongrass
 - Gray = Italian ryegrass
 - Orange = waterhemp
- Halosulfuron
 - Green - rice flatsedge
- Imazethapyr
 - Black = barnyardgrass





Italian Ryegrass Injury 18 Days after Application with Paraquat



Italian Ryegrass Control

- ▶ Resistance limiting POST options
- ▶ Cover crop tolerance and herbicides in fall to inhibit Ryegrass emergence and growth
- ▶ Command, S-metolachlor, Zidua,
- ▶ Tolerance of cereal rye to metribuzin and Command applied POST



Italian Ryegrass Control

- ▶ Resistance limiting POST options
- ▶ Cover crop tolerance and herbicides in fall to inhibit Ryegrass emergence and growth
- ▶ Command, S-metolachlor, Zidua,
- ▶ Tolerance of cereal rye to metribuzin and Command applied POST





Command 1.5 pt/A Spike Cereal Rye



Command 1.5 pt/A Spike Black Oats



Command 1.5 pt/A 1-lf Cereal Rye



Command 1.5 pt/A 1 If Black Oats



Metribuzin 5 oz Spike Cereal Rye



Metribuzin 5 oz Spike Black Oats



Metribuzin 5 oz 1 lf Cereal Rye



Metribuzin 5 oz 1 If Black Oats



Dual Magnum 1.33 pt/A + Metribuzin 5 oz
Spike Cereal Rye



Dual Magnum 1.33 pt/A + Metribuzin 5 oz Spike
Black Oats



Dual Magnum 1.33 pt/A + Metribuzin 5 oz 1 If
Cereal Rye



Dual Magnum 1.33 pt/A + Metribuzin 5 oz 1 If
Black Oats

Dicamba 2024

- All dicamba based labels for DT crops vacated (Xtendimax, Engenia, Tavium)
- EPA violation of FIFRA
- residuals
- timeliness of POST applications (gly/glu)
- Enlist system





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Questions?

