

**Residual herbicides:
Why we need them for year
round weed control in pecan**



Herbicides

- **PRE Herbicides**
 - control germinating & emerging
 - rainfall for activation
 - residual herbicides
 - when to apply is always the key
- **POST Herbicides**
 - controls actively growing emerged weeds
 - Application timing and weed size are critical
- **READ all labels and restrictions**
- **Label is the LAW!!!**
 - Not registered, do not use it!



Resistant Weed Management

- Causes – over reliance on 1 MOA
- How to avoid
 - rotating MOA's



des
ryegrass
herbicide
(W, W)
(C, MS, AR)

Mississippi Counties with Confirmed
Glyphosate-resistant Italian Ryegrass 2012

BOLIVAR	PANOLA
CALHOUN	RANKIN
CARROLL	QUITMAN
COAHOMA	SCOTT
DESOTO	SHARKEY
GRENADA	SUNFLOWER
HOLMES	TALLAHATCHIE
HUMPHREYS	TATE
ISSAQUENA	TIPPAH
LAFAYETTE	TUNICA
LEE	UNION
LEFLORE	WASHINGTON
MADISON	YALOBUSHA
MONTGOMERY	YAZOO



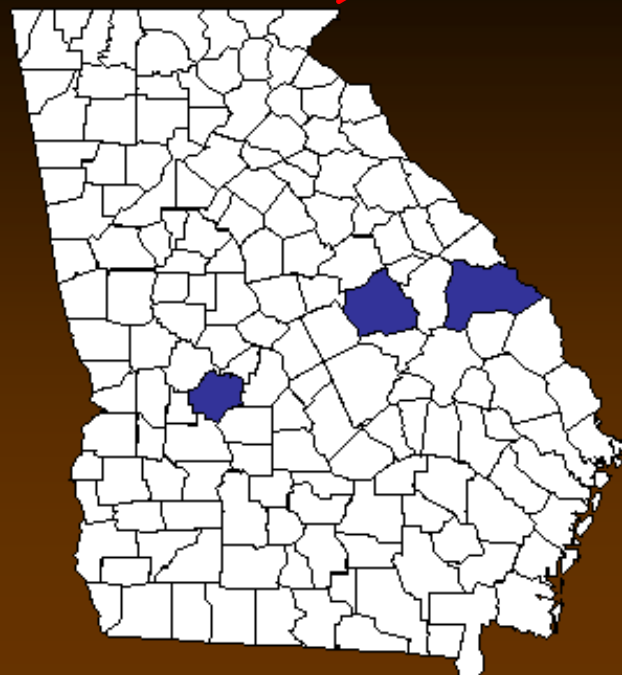
Ryegrass issues

- **Diclofop (MOA 1)**
- **ALS resistant (MOA 2)**
- **Confirmed multiple resistance!**

MOA 1 & MOA 2

- **Next concern**
- **MOA 9 ?????**
glyphosate?

2010 Georgia counties confirmed with Hoelon/Osprey/PowerFlex resistant ryegrass.



2012 Survey

- **Grower meeting survey - questions**
- **Asking which weeds are an issue**
 - In herbicide strip
 - Between tree rows
 - Hardest to control
- **Time of year**
 - Spring
 - Autumn
- **Herbicides used**
 - PRE
 - POST



WEED SURVEY



Weeds

Herbicide

Tree row



RESULTS (n = 200)

Weeds

Herbicide strip

Tree rows



ank
plane

3

20

HERBICIDE SURVEY

<http://www.ent.uga.edu/pmh/Comm-Fruit&Nuts.pdf>

PREs



Rotating MOAs – PRE herbicides

Herbicide	lbs AI/acre	WSSA Classification
Oryzalin Surflan, Oryzalin, AS	2-6	3
Diuron Karmex or Diuron, DF or Liquid	1.6 to 3.2	7
Isoxaben Trellis, DF	0.5 to 1.0	21
Simazine Princep, Simazine, DF or F	2 to 4	5
Norflurazon Solicam, DF	2 to 4	12
Pendimethalin Prowl H2O, ED	2 to 6	3
Rimsulfuron Metric, Solida, Pruvion, WG	0.063	2
Flumioxazin Chateau, WDG	0.19 to 0.38	14
Indaziflam Alien, SE	0.065 to 0.085	29

Resistant Weed Management

GROUP 2 HERBICIDE

Sandea[®] Herbicide

SANDEA[®] is a selective herbicide for control of listed broadleaf weeds and nutsedge

ACTIVE INGREDIENT: Halosulfuron-methyl, methyl 3-chloro-5-(4,6-dimethoxypyrimidin-2-yl)carbamoylsulfamoyl -1-methylpyrazole-4-carboxylate.....	75.0%	% BY WT.
OTHER INGREDIENTS	25.0%	
	TOTAL	100.0%

KEEP OUT OF REACH OF CHILDREN CAUTION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(If you do not understand the label, find someone to explain it to you in detail.)

FIRST AID	
IF IN EYES	<ul style="list-style-type: none"> Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after 5 minutes, then continue rinsing eye. Call poison control center or physician for treatment advice.
IF SWALLOWED	<ul style="list-style-type: none"> Call poison control center or physician immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything to an unconscious person.
HOT LINE NUMBER	
Have the product container or label with you when calling poison control center, doctor or going for treatment. For emergency information concerning this product, call toll free 1-888-478-0798.	

PRECAUTIONARY STATEMENTS HAZARDS TO HUMANS AND DOMESTIC ANIMALS CAUTION

Causes moderate eye irritation. Harmful if swallowed. Avoid contact with eyes or clothing.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

ENGINEERING CONTROLS STATEMENTS: When handlers use closed systems or enclosed cabs in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

USER SAFETY RECOMMENDATIONS

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

ENVIRONMENTAL HAZARDS

This product is toxic to non-target vascular plants. Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.

Halosulfuron-methyl is known to leach through soil into ground water under certain conditions as a result of label use. This chemical may leach into ground water if used in areas where soils are permeable, particularly where the water table is shallow.

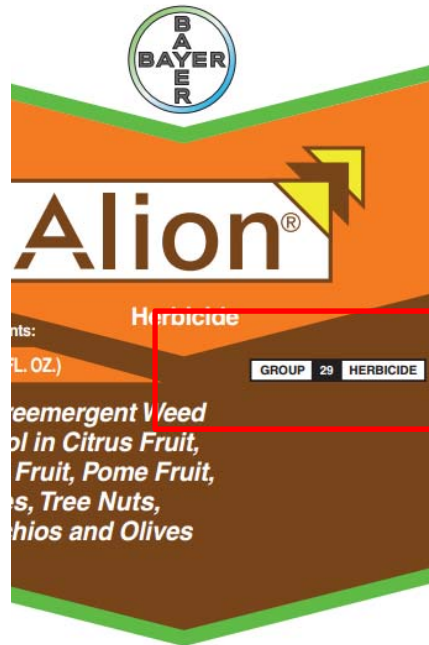
DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

NET CONTENTS: 10 OUNCES

Gowan

Produced For:
Canyon Group LLC,
C/O Gowan Company



ACTIVE INGREDIENT: Indaziflam*	19.05%
OTHER INGREDIENTS:	80.95%
TOTAL:	100.00%

Contains 1.67 pounds of indaziflam per gallon.
*(CAS No: 730979-19-8)

EPA Reg. No. 264-1106 EPA Est. No. 264-DEU-001

KEEP OUT OF REACH OF CHILDREN CAUTION

FOR ADDITIONAL PRECAUTIONARY STATEMENTS: See Inside Booklet.

For **MEDICAL** And **TRANSPORTATION** Emergencies
ONLY Call 24 Hours A Day 1-800-334-7577
For **PRODUCT USE** Information Call 1-866-99BAYER
(1-866-992-2937)

Produced for:
Bayer CropScience LP
P.O. Box 12014, 2 T.W. Alexander Drive
Research Triangle Park, North Carolina 27709
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Product of Germany US80209568D 130226D 03/13

FIRST AID

Remove contaminated clothing.
Rinse skin immediately with plenty of water for 15-20 minutes.
Call a poison control center or doctor for treatment advice.
If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible.
Call a poison control center or doctor for further treatment advice.

If swallowed: Call a poison control center or doctor immediately for treatment

ENGINEERING CONTROLS STATEMENTS:

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USER SAFETY RECOMMENDATIONS:

Users should wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
Users should remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

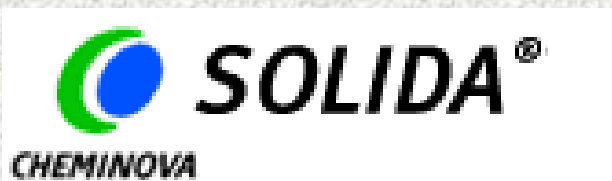
Residual PRE Herbicides

- **Diuron - 7**
 - Direx 4 L, Diuron 4 L, Karmex 1.6-3.2 qt
- **Simazine - 5**
 - Princep 90 DF, Simazine 90 DF, Princep 4 F, Simazine 4 F 2-4 qt
- **Pendimethalin - 3**
 - Prowl H₂O 4 EC 2-6 qt
- **Norflurazon - 12**
 - Solicam 80 DF 2.5-5 lbs
- **Flumioxazin - 14**
 - Chateau 51 WDG 6-12 oz



Residual PRE Herbicides

- **Oryzalin - 3**
 - Surflan 4 AS, Oryzalin 4 AS 2-6 qt
- **Rimsulfuron - 2**
 - Solida 25 WG, Matrix 25 WG, Pruvion 25 WG 4 oz



- **Indaziflam - 29**
 - Alion 1.67 SE 5-6 oz



RESULTS (n = 200)

Pre-emergence

BD & residual

	Glyphosate	Karmex	Alion	Chateau
PRE – Spring	54	15	6	2
PRE – Fall	44	10	6	3

	Sandea	Princep	Surflan	Prowl
PRE – Spring	4	11	11	19
PRE – Fall	1	14	8	13

Why PRE herbicides work

- Many weed species are much more susceptible to herbicides as seedlings or even prior to emergence
- Lower concentration for control
- Continuous control
- Extended over time
 - Herbicide dependent
 - Environment dependent



HERBICIDE SURVEY

<http://www.ent.uga.edu/pmh/Comm-Fruit&Nuts.pdf>

POST



POST Herbicides – ACCase inhibitors

Annual and Perennial Grass Control

- **Fuazifop - 1**

- Fusilade DX 2 EC 8-24 oz



- **Sethoxydim - 1**

- Poast 1.5 EC 1-2.5 pt

- **Clethodim - 1**

- Select 2 EC, Arrow 2 EC, Intensity 2 EC, Select Max, Intensity
One varies by product

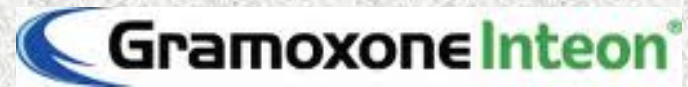


POST Herbicides

Broad Spectrum Control

- **Paraquat - 22**

- Firestorm 3 SL, Parazone, Paraquat concentrate, Gramoxone Inteon 1.75-2.75 pt



- **Glufosinate - 10**

- Rely 280 2-3 qt



- **Glyphosate - 9**

- Roundup Weather Max 5.5 SL, numerous brands 1-2 qt

- **Glyphosate + carfentrazone - 14**

- Rage



POST Herbicides

Broadleaf and Sedge Control

- **2, 4-D amine - 4**
 - Numerous generic formulation 2-3 pt
- **Bentazon - 6**
 - Basagran 4 SL 1.5-2 pt
- **Halosulfuron - 3**
 - Sandea 75 WDG 0.67-1.3 oz
- **Carfentrazone - 14**
 - Aim 0.5-2.0 oz



Sandea
Herbicide



RESULTS (n = 200)

Broad spectrum control

	Glyphosate	Firestorm		
			%	
POST – Summer	44	34	2	
POST – Winter	54	23	5	
	2,4-D	Poast	Sandea	Select
			%	
POST – Summer	24	9	1	9
POST – Winter	25	13	4	5

Back again

Resistant Weed Management

- **Causes – over reliance on 1 MOA**
- **How to avoid**
 - **Keep rotating MOA's**
 - **tank mixing PRE herbicides**
- **Herbicide resistant Italian ryegrass**
 - **ACCase resistant (grass herbicides)**
 - **ALS resistant (GA, SE, MW, W)**
 - **Glyphosate resistant (NC, MS, AR)**
- **Glyphosate & ALS resistant pigweed**
- **Others coming???????????**

Future work

- **Continue to work with industry to develop more answers**
- **Tree path – great options**
- **Vegetative areas**
 - Clovers
 - Which herbicides can we use?
- **Other weed issues?**
 - Plantain
- **Nurseries**

Thank you

- **Financial support**
 - **Georgia Pecan Commission - UGA**
 - **Bayer Crop Sciences**
- **Ducker/Pine Knoll Plantation**
- **Graham Pecan Farm**
- **Merritt Pecan Co.**
- **Sidney Cromer**
technical assistance
- **Questions**

