Research Update on Herbicide-Resistant Poa annua in Georgia

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Is your current herbicide program providing acceptable *Poa annua* control?



Do you use the same herbicides every year for *Poa annua* control?



Which weeds have exhibited reduced levels of control from your herbicides over time?



Poa annua Field Research

Research on 10 golf courses throughout Georgia

- Evaluating PRE and POST application timings
 - Seven modes of action
 - Tank-mixtures of various combinations
 - Bermudagrass fairways

Barricade at 0.75 lb ai/acre applied September



Golf Course 1

Golf Course 2

Specticle at 9 oz/acre applied in September



Golf Course 1

Golf Course 2

Simazine at 1 qt/acre applied in November



Golf Course 1

Golf Course 2

Revolver at 26 oz/acre applied in November



Golf Course 1

Golf Course 2

Revolver + Simazine applied in November



Golf Course 1

Golf Course 2

Roundup + Simazine in January



Roundup + Simazine in February

Fail



Katana 1.5 oz/acre applied 10/30/14

Picture: 3/13/15

Monument 0.5 oz/acre applied 10/30/14

Picture: 3/27/15









0 0.56 1.1 2.2 4.5 9 18 36 72 144

Susceptible

0 0.04 0.07 0.14 0.28 0.56 1.1 2.2 4.5 9 Monument 75WG rate (oz/acre)



Poa annua Treated with Atrazine

Auburn



Bel-Aire



DR3



Target Site Resistance

Non-Target Site Resistance

Collaboration with Scott McElroy at Auburn

Atrazine Absorption



Auburn Bel-Aire (Susceptible) (Resistant) DR3 (Resistant)

Atrazine Present After Absorption



AuburnBel-Aire(Susceptible)(Resistant)

DR3 (Resistant)



0 0.025 0.05 0.1 0.2 0.4 0.8 1.7 3.4 6.7 13.4 Pronamide rate (kg ai/ha)

Root absorption of ¹⁴C-pronamide at 72 HAT



Kerb at 1.5 lb ai/acre (POST)



Kerb at 1.5 lb ai/acre (EPOST)



Bermudagrass Injury From Herbicides (Applied at 300 GDD)





Roundup Pro 16 fl oz/acre

Recommendations (Bermudagrass and zoysiagrass)

• Dintroaniline resistant *Poa* control

 Specticle Flo at 9 oz/acre or 4.5 FB 4.5 oz in Sept./early October

– Kerb at 1.5 lb ai/acre in mid-November/Dec.

- Sulfonylurea + simazine in mid-November

Recommendations (Bermudagrass and zoysiagrass)

- Rotation programs for PRE herbicides
 - Get off of the exclusive Specticle use in fall!
 - <u>Every other year</u> rotate prodiamine, Kerb, Ronstar 2G in a PRE program
- Specticle (indaziflam)
 - Concerns over reduced efficacy over years
 - In Georgia we need a total of 9 oz/acre applied as a PRE timing
 - Early POST timings are <u>not recommended</u> for Specticle alone or in tank-mixtures with triazine herbicides

Recommendations (Bermudagrass and zoysiagrass)

Postemergence herbicides in bermudagrass

– Revolver 26 oz/acre + simazine 1 qt/acre

- Monument 0.5 oz/acre + simazine 1 qt/acre
- Katana 1.5 oz/acre + simazine 1 qt/acre
- Kerb at 1.5 lb ai/acre in mid-November/Dec.
- Sureguard at 12 oz/acre in December**

Recommendations (Bermudagrass only)

- Rescue treatments for mature *Poa* in midwinter
 - Finale
 - Roundup + simazine

Recommendations (Seashore paspalum)

- Preemergence control of *Poa annua*
 - Georgia: Specticle at 4.5 FB 4.5 oz/acre
 - Central and south Florida: Specticle at 3 FB 3 oz/acre
 - Barricade (prodiamine) at 0.75 lb ai/acre
- Postemergence control of *Poa annua*
 - Katana at 1 oz/acre in late Nov to early Dec.
 - Xonerate 4 to 6 oz/acre (WG formulation)
 - Katana + Xonerate after greenup in spring

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Annual Bluegrass Control Programs for Georgia Lawns



Patrick McCullough



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Annual bluegrass control in tall fescue lawns

Preemergence herbicides applied in late summer or fall may prevent annual bluegrass establishment in tall fescue (Table 1). Dimitroamline (DNA) herbicides are widely used for preemergence control of annual bluegrass in turf. The DNA herbicides include pendimethalin (Pendulum) prodiamine (Barricade), and oryzalin (Surflan). These herbicides are relatively cheap, broad spectrum, and safe to use on established tall fescue. However, the exclusive use of DNA herbicides over the years has led to the spread of resistant biotypes in Georgia. Dithiopyr (Dimension) is a pyridine herbicide that inhibits mitosis at a different site of action than the DNAs. Annual bluegrass with resistance to DNA herbicides in Georgia has also shown cross-resistance to Dimension (Figure 4). Therefore, it is recommended that turf managers select other herbicides for controlling annual bluegrass if DNA resistance is a concern.



Figure 4. Preemergence control of dinitroaniline-resistant annual bluegrass with Kerb after six weeks.

Turf managers have several alternatives to DNA herbicides for preemergence control of annual bluegrass (Table 1). Oxadiazon (Ronstar 2G) and bensulide (Bensumec 4L) offer different modes of action than the DNAs for preemergence control of annual bluegrass in tall fescue. When applied to susceptible weeds, Ronstar inhibits chlorophyll and Bensumic inhibits hpid biosynthesis. However, Ronstar is labeled for nonresidential turf and Benumec can only be used in residential lawns. These herbicides should be considered for use in rotation programs with DNA herbicides for annual bluegrass control in tall fescue.

UGA Cooperative Extension Bulletin 1463 . Annual Bluegrass Control Programs for Georgia Lawns

Table 2. Herbicide alternatives to exclusive use of dinitroanilines (Group 3 herbicides), sulfonylureas (Group 2 herbicides), and triazines (Group 5 herbicides) for annual bluegrass control in warm-season grasses.

Group Number®	Treatments	Timing ^b	Rate	Control	Comments
2+5	Sulfonylurea herbicide ^d + atrazine/simazine	PRE + POST	See labels	E	Apply in Nov/Dec to bermudagrass or zoysiagrass
3°	Kerb 50WP, Kerb 3.3SC (pronamide)	PRE + POST	1 to 1.5 lb ai/acre	GE	Apply in Nov/Dec to nonresidential warm-season lawns
8	Bensumec 4L (bensu- lide)	PRE	3 gal/acre	FG	Apply to residential lawns only
9	Roundup, others (glyphosate)	POST	0.38 lb ae/acre	GÆ	Apply to dormant bermudagrass only
9+5	Roundup, others (glyphosate) + atra- zine/simazine 4L	PRE + POST	0.38 lb ae/acre + 1 lb ai/acre	E	Apply to dormant bermudagrass only
14	Ronstar 2G, others (oxadiazon)	PRE	3 lb ai/acre	GÆ	Apply to nonresidential lawns only Do not apply to centipedegrass
14	Sureguard 51WG (Aumioxazin)	PRE + POST	10-12 oz/acre	FG	Apply to dormant bermudagrass in early winter
22	Reward 2L (diquat)	POST	2 pt/acre	F-G	Apply to dormant bermudagrass or zoysiagrass
29	Specticle Flo (indazi- flam)	PRE	6-10 fl oz/acre	GE	Apply in Sept/Oct
29 + 5	Specticle Flo (indazi- flam) + atrazine/sima- zine	PRE + POST	6-10 fl oz + 1 lb ai/acre	E	Apply in Oct/Nov to warm-season lawns

^aGroups: 2 – acetolactate synthase inhibitors, 3 – mitotic inhibitors, 5 – Photosystem II inhibitors, 8 – lipid synthesis inhibitors, 9 – EPSP synthase inhibitor, 14 – protoporphyrinogen oxidase inhibitors, 22 – Photosystem I disruptors, 29 – cellulose synthesis inhibitors.

^bPRE – preemergence, POST – postemergence

Control rankings: Excellent (E) - ≥90 percent, Good (G) - 80 to 89 percent, Fair (F) - 70 to 79 percent

dExamples of sulfonylureas are flazasulfuron (Katana), foramsulfuron (Revolver), rimsulfuron (TranXit, Rimsulfuron, others) and trifloxysulfuron (Monument).

"Kerb is mitotic inhibitor with a different site of action than dinitroaniline herbicides. In Georgia, Kerb has shown to provide preemergence control of annual bluegrass biotypes with resistance to dinitroaniline herbicides.

Turf Herbicides

Turfgrass Herbic Selection and Resistance Mar	cides nagement
Turf areas	
Athletic Fields	
Turfgrass species	
Bermudagrass	
Weed species	
Annual Bluegrass	
Application timing	
Postemergence	
Selective herbicides for control	
✓ Select	
amicarbazone (Xonerate) atrazine (Aatrex, others)	
flazasulfuron (Katana)	
foramsulfuron (Revolver)	
nronamide (Kerh)	
rimsulfuron (Tranxit)	
simazine (Princep, others)	
thiencarbazone + foramsulfuron + halosulfuron (Tribute Total)	Created By Dr. Patrick McCulloug
trifloxysulfuron (Monument)	

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Turf Herbicides

Turfgrass Her Selection and Resistance	rbicides e Management
Turf areas	
Athletic Fields	
Turfgrass species	
Bermudagrass	
Weed species	
Annual Bluegrass	
Application timing	
Postemergence	
Selective herbicides for control	
amicarbazone (Xonerate)	
Other herbicides (Alternative mode of action)	

Turf Herbicides

Turfgrass Herbicides Selection and Resistance Management

Turf areas		
Athletic Fields		
Turfgrass species		
Bermudagrass		
Weed species		
Annual Bluegrass		
Application timing		
Postemergence		
Selective herbicides for control		
amicarbazone (Xonerate)		
4		_
Group 2 - ALS Inhibitors		
foramsulfuron (Revolver)		[]
rimsulfuron (Tranxit)		:=
thiencarbazone + foramsulfuron + halosulfuron (Tribute Total)	and the second sec	
trifloxysulfuron (Monument)		AND REAL PROPERTY AND ADDRESS OF ADDRES
Group 3 – Microtubule Assembly Inhibitors	Created By	Dr. Patrick McCullough
pronamide (Kerb)		

