



Further Evaluations of Postemergence Herbicides on Seedling Bermudagrass

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Summary. Bermudagrass (*Cynodon dactylon* [L.] Pers.) is the major turfgrass used for golf course fairways, tees, sports fields, and home lawns in the transition zone and farther south. In recent years, efforts to develop seed-propagated cultivars have been successful. Seeded cultivars have not been used to any great extent in the turfgrass industry and data on establishment and management are lacking. The objective of this study was to determine the tolerance of seedling bermudagrass to several commonly used postemergence herbicide combinations. ‘Riviera’ bermudagrass was seeded on 15 June 2003. Twelve different herbicide combinations were applied to the seedling turf at 2 weeks after emergence. Bermudagrass seedlings showed good tolerance to most of the herbicides, including popular herbicide combinations such as Trimec Classic + MSMA and Manor + MSMA. The only herbicides that caused significant levels of damage were a combination of Sencor and MSMA. These data demonstrate that the tolerance of seedling bermudagrass to postemergence herbicides is good and that a range of postemergence herbicides can be used during establishment.

Bermudagrass (*Cynodon* spp.) continues to be the predominant turfgrass used for golf course fairways, tees, and roughs throughout the South and into the transition zone. The popularity of this species is based on the performance of improved cultivars at low mowing heights, the recuperative potential of the turf, and the tolerance of the grass to a wide range of turfgrass pests.

In the past two decades, major efforts by both academic and industry breeders have been underway to select improved *C. dactylon* clones and make crosses to produce fertile, seed-propagated cultivars of

bermudagrass that can be used in high-maintenance turfgrass situations. As a testament to those efforts, the seed-propagated cultivars in the 2002 National Turfgrass Evaluation Program bermudagrass trial outnumber the vegetative hybrids by two to one (Rogers 2003). It is almost certain that these breeding efforts will continue to yield significant changes in seed-propagated bermudagrasses and these cultivars will soon be a major force in the turfgrass industry.

Although the quality of seeded bermudagrass cultivars has undoubtedly not reached its peak, several cultivars have been released from breeding programs, some of which have rated very well in cultivar trials around the U.S.. The cultivars, ‘Riviera’, ‘Princess’, and ‘Yukon’ have received the most attention by the turfgrass industry due to the vast improvement in turfgrass quality noted with these cultivars, as well as improvements in stress-related issues such as cold tolerance. Other cultivars such as ‘Mirage’, ‘Southern Star’, ‘Blackjack’, and ‘Transcontinental’ have also been released in recent years and these cultivars also show improvement over earlier seeded bermudagrass types (Morris, 2003).

With the rapid release of seeded bermudagrass cultivars, there is a great need to understand factors that influence the establishment and maintenance of these grasses. Some of the issues that need to be addressed include weed control strategies, methods to use these grasses in turf renovation, and the testing of these grasses in fringe environments. Research on seeded bermudagrass establishment and management has been conducted and is ongoing at numerous universities throughout the transition zone, including Oklahoma State Univ., Kansas State Univ., Univ. of Kentucky, Purdue Univ., and Mississippi State Univ.. At the Univ. of Arkansas, we have focused on two major factors of seeded bermudagrass use and management. These include the tolerance of seedling bermudagrass to common postemergence herbicides and the effect of establishment procedures on first-year winter survival.

Several trials investigating the tolerance of seedling bermudagrass to common postemergence herbicides have already been conducted at our location (McCalla and Richardson, 2002). The intent of these trials has been to determine how early after seedling emergence herbicides can be safely applied and to determine which specific herbicides are safe to use during this early stage of growth.

In a previous trial (McCalla and Richardson, 2002), individual herbicides that are routinely used to control grassy and broadleaf weeds were applied at labeled rates to bermudagrass seedlings at one, two, and four weeks after emergence (WAE). The chemicals tested included 2,4-D, dicamba, clopyralid, quinclorac, metsulfuron, diclofop and MSMA. Herbicide injury was monitored frequently after application of the herbicides and turfgrass cover was documented at 30 and 60 days after treatment (DAT).

The overall results of this trial indicated a good tolerance of seedling bermudagrass to all of the postemergence herbicides tested (McCalla and Richardson, 2002). Diclofop applications to seedling bermudagrass resulted in significant injury in the first seven days after application, but this injury subsided quickly and there was no difference in turfgrass cover between any of the herbicide treatments and the control at 30 DAT. Other herbicides that caused injury included metsulfuron and dicamba, but the bermudagrass quickly recovered from the initial injury caused by these herbicides.

Although the results of these trials indicated a good tolerance of seedling bermudagrass to postemergence herbicides, this was certainly

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not an exhaustive list of herbicides and the turfgrass industry generally applies combinations of materials to enhance the effectiveness of the control. As such, the objective of this trial was to investigate the tolerance of seedling bermudagrass to combination herbicides rather than individual compounds, as the use of tank mixes or combination products to control weeds is a much more common practice than the use of single herbicide compounds.

Materials and methods

In this trial, a single herbicide application date (2 weeks after emergence) was tested. Plots were established at the University of Arkansas Research and Extension Center in Fayetteville, Ark. The area was fumigated with methyl bromide prior to establishing ‘Riviera’ seeded bermudagrass at 48.8 kg pure live seed (PLS) ha⁻¹ (1.0 lb. PLS / 1000 ft²) on 15 June 2003. The herbicides and rates tested in this trial are listed in Table 1. Data collected included a visual rating of herbicide injury (0-9, with 0 = no injury and 9 = completely dead) periodically after herbicide application and turfgrass establishment rates were determined using digital image analysis (Richardson et al., 2001) at 7, 14, and 21 days after treatment (DAT).

Results and discussion

Significant herbicide injury was observed with several of the herbicide combinations at 3 DAT (Table 2), with the most severe injury observed on turf treated with Sencor + MSMA. The injury caused by Sencor + MSMA plots was very severe at all of the early rating dates and was still present at 21 DAT. This herbicide was also tested at 4 WAE (data not shown) and the injury was not as severe as the applications made at 2 WAE, indicating that this treatment might be used after mowing has commenced. The effects of MSMA + Sencor was also observed in the turfgrass cover data, as those plots had only 24% cover at 7 DAT, while the control plots had over 95% cover (Table 3). A significant reduction in turfgrass cover was still observed in Sencor + MSMA plots at 14 and 21 DAT.

MSMA when combined with either Trimec Classic or Confront also caused significant injury to the seedling turf (Table 2). Although these treatments caused a significant decrease in turfgrass cover at 7 DAT (Table 3), these plots had recovered significantly by 21 DAT and turfgrass cover was near the control plots. Other treatments tested in this trial caused little or no injury to the bermudagrass seedlings.

Conclusions

Weed control during the establishment phase will be critical to successfully establish bermudagrass turf from seed. The results from this trial will provide golf course superintendents and other turfgrass managers a wide array of herbicides that can be used during seeded bermudagrass establishment. Greenhouse studies conducted at our location have also shown that herbicide tolerance levels are similar for a range of seeded bermudagrass cultivars (data not shown).

Literature cited

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Table 1. Herbicide treatments applied to seeded bermudagrass at 2 weeks after emergence.

Sencor + MSMA	0.38 + 2.0 lb. ai / acre	0.42 + 2.24 kg ai / ha
Trimec Classic + MSMA	3.5 pints / acre + 2.0 lb. ai / acre	3.5 pints / acre + 2.24 kg ai / ha
Confront + MSMA	1.0 pt / acre + 2.0 lb. ai / acre	1.2 l / ha + 2.24 kg ai / ha
Monument + MSMA	0.56 oz / acre + 2.0 lb. ai / acre	0.039 kg / ha + 2.24 kg ai / ha e
Flazosulfuron + MSMA	3.0 oz / acre + 2.0 lb. ai / acre	0.21 kg / ha + 2.24 kg ai / ha
Revolver + MSMA	17.4 oz / acre + 2.0 lb. ai / acre	1.21 kg / ha + 2.24 kg ai / ha
Drive + MSMA	0.75 + 2.0 lb. ai / acre	0.84 + 2.24 kg ai / ha
Manor + MSMA	0.5 oz / acre + 2.0 lb. ai / acre	0.035 kg / ha + 2.24 kg ai / ha
Drive	0.75 lb. ai / acre	0.84 kg ai / ha
Drive fb Drive	0.5 fb 0.5 lb. ai / acre	0.56 fb 0.56 kg ai / ha
Lontrol + MSMA	0.38 + 2.0 lb. ai / acre	0.42 + 2.24 kg ai / ha
Untreated Control		

Table 2. Tolerance of 'Riviera' seedling bermudagrass to postemergence herbicides applied at 2 weeks after emergence.

Herbicide	3DAT†	5DAT	7DAT	10DAT	14DAT	21DAT	28DAT	Avg.
	----- Herbicide Injury ‡ -----							
Sencor + MSMA	8.0	7.8	7.5	6.5	4.3	2.0	0.0	5.1
Trimec Classic + MSMA	2.3	3.0	3.3	2.5	1.8	0.0	0.0	1.8
Confront + MSMA	1.5	3.0	2.3	1.5	0.8	0.0	0.0	1.3
Monument + MSMA	3.3	2.8	1.3	0.8	0.8	0.3	0.0	1.3
Flazosulfuron + MSMA	2.3	2.3	1.8	1.5	0.8	0.0	0.0	1.2
Revolver + MSMA	2.8	2.3	1.0	1.3	0.8	0.3	0.0	1.2
Drive + MSMA	1.5	2.8	1.8	1.3	0.3	0.0	0.0	1.1
Manor + MSMA	2.0	1.8	1.3	0.8	0.3	0.0	0.0	0.9
Drive	0.5	1.3	1.5	1.3	0.8	0.5	0.0	0.8
Drive fb Drive	0.5	1.0	1.3	0.8	0.8	1.3	0.0	0.8
Lontrol + MSMA	2.0	1.8	0.3	0.5	0.5	0.0	0.0	0.7
Untreated Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.8	1.3	1.3	1.2	0.7	0.4	0.0	0.6

†- DAT – days after treatment

‡- herbicide injury was rated on a scale of 0-9, with 0=no injury and 9=dead turf.

Table 3. Establishment rates of 'Riviera' seedling bermudagrass after applying postemergence herbicides at 2 weeks after emergence.

Herbicide	7 DAT†	14 DAT	21 DAT
	----- Turfgrass Cover ‡ (%) -----		
Sencor + MSMA	24.2	75.1	89.0
Trimec Classic + MSMA	64.6	94.0	97.3
Confront + MSMA	79.2	95.7	97.3
Monument + MSMA	94.0	99.0	98.7
Flazosulfuron + MSMA	88.4	97.5	97.4
Revolver + MSMA	92.0	98.4	98.5
Drive + MSMA	97.2	99.5	98.7
Manor + MSMA	87.9	97.7	98.5
Drive	96.6	99.7	99.3
Drive fb Drive	97.4	99.5	99.3
Lontrol + MSMA	98.2	99.3	99.5
Untreated Control	95.1	99.2	99.4
	13.8	4.0	1.6

†- DAT — days after treatment

‡- turfgrass cover was measured using digital image analysis.