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# Herbicide strategies for newly seeded bermudagrass

Pre- and post-emergence herbicides can be used effectively when establishing bermudagrass from seed.

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Bermudagrass remains the most popular warm-season turfgrass in the southern United States. Until recently, seeded bermudagrass cultivars did not offer the quality or performance of vegetatively propagated hybrids and selections. However, in the 1997 National Turfgrass Evaluation Program bermudagrass test, several new seeded cultivars of bermudagrass demonstrated quality equal to or higher than the vegetative standards, Tifway and Midlawn (4). Of the seeded genotypes, the cultivar Princess and the experimental line OKS 95-1 showed exceptional quality relative to the hybrids. These improvements in overall turf quality of seeded cultivars have made seeding a high-quality bermudagrass turf a realistic option.

## Hurdles to seed establishment

Competition from grass and broadleaf weeds may hinder or prevent successful establishment of bermudagrass from seed. Although many studies have evaluated weed-control strategies and herbicide tolerance of established bermudagrass, minimal work has been done to develop weed-control strategies that are safe to use when establishing a seeded bermudagrass. This is a critical need, because post-emergence herbi-

cides can lead to varying degrees of injury, including growth retardation, altered plant development and, ultimately, plant death (3). Finding appropriate post-emergence herbicides and application timings that are effective in weed control and cause limited injury to bermudagrass seedlings is important.

Pre-emergence herbicides have been used effectively in the establishment of vegetatively propagated bermudagrasses and in established bermudagrass turf, but they have limited applications in seed establishment plantings. One technique for protecting seeds from the effects of pre-emergence herbicides is to place a band of activated charcoal over a seeded furrow (2). Charcoal, a porous material that can bind and deactivate herbicides, has been used effectively in conjunction with pre-emergence herbicides to establish production fields of cool-season grasses (2). It has also been used in the establishment of centipedegrass turf (1), but not in the establishment of a seeded bermudagrass turf.

## Experiments

The objective of the post-emergence study was to evaluate injury and application timings of seven post-emergence

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- New seeded bermudagrass cultivars require new weed-control strategies.
- We evaluated injury and application timings of seven post-emergence herbicides on newly seeded Princess bermudagrass.
- Although post-emergence herbicides caused significant injury to newly seeded bermudagrass, all plots recovered fully.
- Charcoal banding permits the use of pre-emergence herbicides in a seeded planting.

Key points



Photos courtesy of John McCalla

Princess bermudagrass treated with charcoal and pre-emergence herbicides immediately after seeding is shown four weeks after seeding.

herbicides on newly seeded bermudagrass (see the table). The pre-emergence herbicide experiment evaluated the use of activated charcoal banding in conjunction with three pre-emergence herbicides as a means of establishing seeded bermudagrass.

*Site preparation*

Pre-emergence and post-emergence

herbicide studies were conducted at the University of Arkansas Research and Extension Center, Fayetteville. Before planting, both plot areas were fumigated with methyl bromide (67 percent) and chloropicrin (33 percent) at a rate of 392 pounds/acre to ensure a weed-free site. Because the weed-control effectiveness of the herbicides tested was established previously, it was easier to rate herbicide injury without interference from weeds. Princess seeded bermudagrass was chosen for both studies because of its high quality and commercial availability.

*Post-emergence study*

In the post-emergence herbicide experiment, the plot area was broadcast seeded on June 1, 2000, with Princess at a rate of 0.5 pound/1,000 square feet, and herbicide was applied at one, two and four weeks after emergence (WAE), which occurred approximately seven days after seeding. Visual injury ratings were taken at three, five, seven, 15, 30 and 60 days after treatment (DAT).

*Pre-emergence study*

For the pre-emergence study, Princess was planted in drill-rows on 12-inch centers at a seeding rate of 84 seeds/linear foot. This seeding rate was

Herbicide treatments		
Brand name	Common name	Rate (lb ai/acre)
<b>Post-emergence</b>		
Various brands	MSMA	1.0
Manor	metsulfuron	0.019
Illoxan	diclofop	1.0
Lontrel	clopyralid	0.5
Vanquish	dicamba	0.5
Various brands	2,4-D amine	0.5
Drive	quinclorac	0.75
<b>Pre-emergence</b>		
Barricade	prodiamine	1.0
Ronstar	oxadiazon	2.0
Karmex	diuron	1.0

based on seed size and the within-row plant density that is desirable for most row-planted crops. The final seeding rate was 0.01 pound seed/1,000 square feet. The seeds were mixed and planted with Greens Grade Milorganite (6-2-0) as a carrier at a rate of 4 pounds/1,000 square feet. For half of the plots, activated charcoal was banded (1 inch) directly over the seeded row using a CO<sub>2</sub> sprayer at a rate of 0.5 gram charcoal/linear foot.

Pre-emergence herbicides were applied directly after planting to both the charcoal-treated and untreated seed rows. The experimental design was a split-plot design, with charcoal treatments assigned as main plots and herbicide treatments assigned as subplots. Visual emergence ratings were taken at three, five and seven days after emergence (DAE), which occurred approximately seven days after seeding. Percentage turfgrass cover was evaluated weekly using digital image analysis with SigmaScan software (5).

## Results

### Post-emergence study

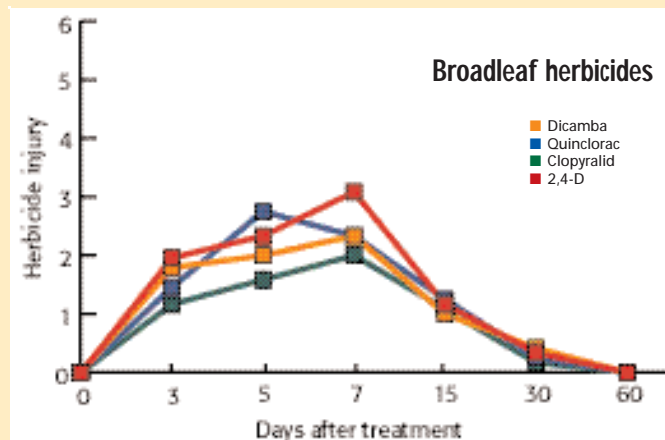
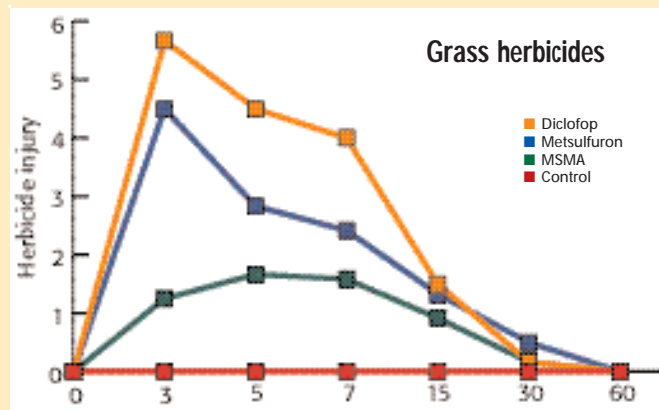
The degree of injury resulting from the various post-emergence herbicides was statistically the same at one, two and four WAE (data not shown). Therefore, the data from the three application timings were averaged for this report. All the post-emergence herbicides tested in this study caused some degree of injury to the newly seeded Princess. Diclofop, metsulfuron and 2,4-D produced the highest levels of injury. Surprisingly, the monosodium methanearsenate (MSMA) produced very little injury on the newly established grass, which permits effective control of weeds such as crabgrass during the establishment period. There were no significant differences in bermudagrass injury among MSMA, clopyralid, quinclorac and dicamba, whereas diclofop, metsulfuron and 2,4-D did show statistically higher total injury over other herbicides.

Although some injury was observed with all treatments, plots with herbicide injury had almost recovered fully at 30 DAT, and there was no evidence of herbicide injury in any treatment at 60 DAT. These data demonstrate that several post-emergence weed-control strategies are available for control of both broadleaf and grassy weeds in newly seeded bermudagrass turf.

### Pre-emergence study

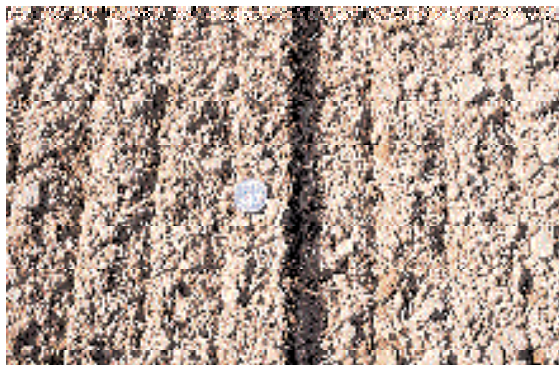
In the pre-emergence study, activated charcoal protected seeds successfully from pre-emergence herbicides,

## Herbicide injury



Herbicide injury of newly seeded Princess bermudagrass as affected by grass (top) and broadleaf (bottom) herbicides. Herbicides were applied at one, two and four weeks after emergence, and data for this graph are averaged across all application periods. Error bars indicate significant differences between herbicide treatments at each evaluation period ( $P \geq 0.05$ ).

but those not treated with charcoal failed to emerge (data not shown). In addition, there were no significant differences in emergence between control charcoal-banded treatments and control non-charcoal-banded plots (data not shown). In the charcoal-banded plots, there were no significant differences in percentage turfgrass cover at 1 WAE among all herbicide treatments.



Charcoal banding of a newly seeded drill row deactivates pre-emergence herbicides in the seed row and allows germination of the bermudagrass.

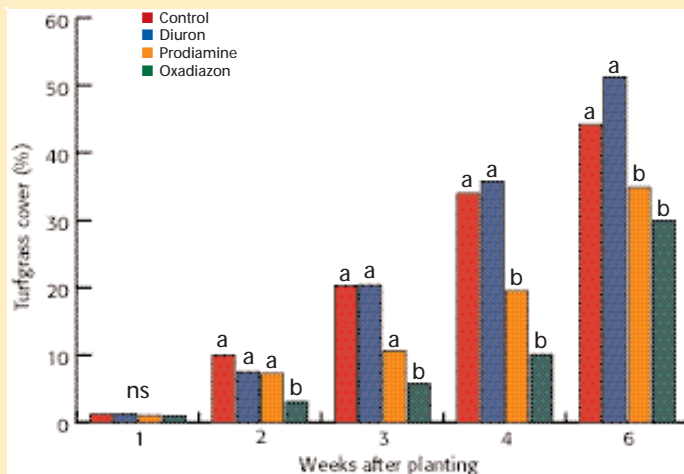
Plots treated with oxadiazon and proflaminate produced significantly less cover at two, three and four weeks after planting than control plots or diuron-treated plots. These data suggest that, compared to oxadiazon and proflaminate, diuron may be more tightly bound by the charcoal, but fur-

ther studies need to be conducted to verify this point. Although complete cover was not reached in this trial because of a late-July establishment date, it is predicted that complete cover can be obtained in six to eight weeks using this technique.

### Overview

In summary, several post-emergence herbicides caused significant injury to newly seeded Princess bermudagrass, including diclofop, metsulfuron, 2,4-D and dicamba. However, all plots recovered fully from herbicide injury by 30 DAT. These data demonstrate that a range of post-emergence herbicide programs can be used effectively to control weeds in newly seeded bermudagrass. Charcoal banding also proved to be an effective means of establishing bermudagrass from seed and permits the use of pre-emergence herbicides in a seeded planting. This technique is of great value when attempting to establish a seeded bermudagrass in an area with a history of annual, grassy weeds. ■

## Charcoal and pre-emergents



Turfgrass cover was affected over a six-week period by charcoal banding and pre-emergence herbicides. Different letters within an evaluation date indicate a significant difference ( $P \geq 0.05$ ).

### Acknowledgments

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