Plant Growth Regulators to Retard Growth of Bermudagrass and Dallisgrass in the Landscape

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ABSTRACT

Three plant growth regulators were applied to a mixed species turf containing common bermudagrass (*Cynodon dactylon* (L.) Pers.) and dallisgrass (*Paspalum dilatatum* Poir.). Embark 2-S (mefluidide) (N[2,4-dimethyl-5-[[(trifluoromethyl)-sulfonyl]amino]phenyl] acetamide) was applied at the rate of 0.75, 1.5, and 3.0 fl oz per 1000 ft^2; Primo (4-[cyclopropyl-α-hydroxy-methylene]-3,5-dioxo-cyclohexanecarboxylic acid ethyl ester) was applied at the rate of 0.38, 0.75, and 1.5 fl oz per 1000 ft^2; and Cycocel (chlormequat) ([2-chloroethyl] trimethylammonium chloride) was applied at the rate of 1.88, 3.75, and 7.50 fl oz per 1000 ft^2. The treatments were diluted and applied with a pump-up sprayer at the rate of 3 gal per 1000 ft^2. Embark and Primo were both effective in reducing weight of clippings and weekly regrowth height of bermudagrass by as much as two-thirds, but were effective for only 3 weeks when applied in early July. Embark and Primo were also less effective in reducing regrowth height of dallisgrass, and Cycocel was ineffective on both species. The regrowth rate of dallisgrass would not allow a reduced number of mowings if visual effectiveness was to be maintained. No phytotoxic effects were observed.

KEYWORDS: Embark, Primo, Cycocel, mefluidide, chlormequat, clipping weights, regrowth rate

Mowing turf on residential, commercial, and public properties, including right-of-ways, is time consuming. When maintenance is contracted, mowing can also be costly. Warm-season turfgrasses such as bermudagrass often require weekly mowing maintenance in residential and business locations, and 20 or more mowings may be required (Rogers et al., 1987). Although plant growth regulators that suppress growth have been available for some time, most chemical retardant research on turfgrasses has been conducted on cool-season species (Bhowmik, 1987; Christians, 1985; Christians and Nau, 1984; Dernoedon, 1984; Elkins, 1974; Johnson, 1989; McCarty et al., 1985; Schmidt and Bingham, 1977; Watschke, 1976) and inconsistent results and phytotoxic reactions are often noted.

Embark (Mefluidide) has been successfully used to suppress seedhead formation in centipedegrass (Johnson, 1990), and metasulfuron methyl and sulfometuron methyl have suppressed growth of common bermudagrass (Rogers et al., 1987). Cycocel (chlormequat) has had little effect on suppression of bermudagrass in previous tests

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(Elkins et al., 1977). Primo, a newer plant growth regulator which has received more limited testing in landscape situations, has capabilities to retard growth of turfgrasses (Knoop, 1993).

This project was conducted to evaluate the effects of three plant growth retardants on growth of a mixed sod containing common bermudagrass and dallisgrasss.

METHODS AND MATERIALS

Plots were prepared in an established landscape turf containing a native mixture of common bermudagrass (*Cynodon dactylon* (L.) Pers.) and dallisgrass (*Paspalum dilatatum* Poir.) on the East Texas State University campus, Commerce. The experimental area was fertilized monthly with a 15-5-10 fertilizer at the rate of 1.0 lb of nitrogen per 1000 ft^2 beginning in early May. Plots were irrigated with an overhead sprinkler system as needed throughout the experiment.

In early June, a broadcast application of an auxin-type herbicide was applied to remove any broadleaf weeds. Plots measuring 5 ft by 5 ft were established in early July with an 18-inch buffer zone between all plots. The buffer zone was created by using an 18-inch mower adjusted to its lowest mowing height for scalping purposes and the area was scalped weekly to maintain plot integrity.

On 13 Jul 1993, the following plant growth retardant treatments were applied to plots that were freshly mowed to the 2-inch height: Embark 2-S (mefluidide) (N[2,4-dimethyl-5-[[(trifluoromethyl)-sulfonyl]amino]phenyl] acetamide) at the rate of 0.75, 1.5, and 3.0 fl oz per 1000 ft^2; Primo (4-[cyclopropyl-α-hydroxy-methylene]-3,5-dioxo-cyclohexanecarboxylic acid ethyl ester) at the rate of 0.38, 0.75, and 1.5 fl oz per 1000 ft^2; and Cycocel (chlormequat) ([2-chloroethyl] trimethylammonium chloride) at the rate of 1.88, 3.75, and 7.50 fl oz per 1000 ft^2. The growth retardant treatments were diluted and applied at the rate of 3 gal per 1000 ft^2. All solutions contained 0.1% X-77 surfactant as a wetting agent. Control plots were sprayed with an equal amount of water containing wetting agent only. All applications were made using a pump-up hand sprayer.

Starting one week after treatment application and continuing on a weekly basis for four consecutive weeks, the average height of both bermudagrass and dallisgrass was measured in each plot above the 2-inch mowing height. Following regrowth measurements, each plot was then mowed at the 2-inch height using a traditional bagging mower and weight of clippings collected from each plot was recorded.

Experimental design was a randomized complete block with three replications. Data were analyzed by analysis of variance and means were separated by LSD, $P = 0.05$.

RESULTS AND DISCUSSION

The main effects of time after application and plant growth retardant treatment significantly affected regrowth height of bermudagrass and dallisgrass, and weight of clippings (Table 1). The interactive effect was significant on clipping weight.

The weekly regrowth of bermudagrass above the 2-inch level was suppressed for three weeks by plant growth retardants as indicated by the main effect of time after application (Table 2).

Table 1. Probabilities of significance for treatment effects on turfgrass growth.

Source	Weekly regrowth		Weight of clippings
	Bermudagrass	Dallisgrass	
Rep	0.0198	0.7679	0.0107
Time	0.0018	0.0010	0.0001
Treatment	0.0001	0.0001	0.0001
Time * Treatment	0.4098	0.3001	0.0024

Table 2. Main effects of time after application and treatment on regrowth height of bermudagrass and dallisgrass, and weight of clippings, 1993.

Main Effect	Weekly regrowth†		Weight of clippings
	Bermudagrass	Dallisgrass	
	----------inches----------		lbs
Time after application			
1 week	1.13 b‡	4.23 ab	4.10 c
2 weeks	1.32 b	3.81 bc	4.37 bc
3 weeks	1.33 b	3.34 c	5.00 b
4 weeks	1.59 a	4.38 a	6.57 a
Treatment			
Control	2.06 a	5.10 a	7.50 a
Embark§			
0.75	1.44 bc	3.13 d	4.17 c
1.50	1.21 cd	3.25 d	3.67 c
3.00	0.78 e	3.15 d	3.25 c
Primo§			
0.38	0.88 de	4.03 bcd	3.92 c
0.75	0.68 e	3.48 cd	3.25 c
1.50	0.63 e	3.28 d	3.08 c
Cycocel§			
1.88	2.00 a	4.21 abc	7.83 a
3.75	1.75 ab	5.00 a	6.33 b
7.50	2.03 a	4.78 ab	7.08 ab

†Regrowth measured above the 2.0-inch mowing height.
‡Means separation within columns and main effects by LSD, $P = 0.05$.
§Plant growth retardant rates expressed as fl oz per 1000 ft^2.

However, as indicated by the main effect of treatment, Cycocel did not reduce the regrowth height of bermudagrass at any of the three rates used when compared to the control. Primo was most effective in reducing regrowth height at 0.75 and 1.50 fl oz per 1000 ft^2 and Embark was most effective at the higher rate of 3.00 fl oz per 1000 ft^2.

Weekly regrowth of dallisgrass was much greater than for bermudagrass and was most affected during the third week following treatment as indicated by the main effect of time after application (Table 2). As with bermudagrass, weekly regrowth of dallisgrass was not effected by Cycocel. Embark and Primo both reduced dallisgrass regrowth height compared to the control and both were statistically similar in effect.

The weight of clippings collected were lowest during the first week after treatment and most of the growth suppression effect had been lost after 4 weeks (Table 2). Cycocel was relatively ineffective in reducing weight of clippings compared to the control. Both Embark and Primo were equally effective in reducing clipping weight, even at the lower rates. Embark and Primo affected clipping weight slightly differently over time as indicated by the significant interaction between time after application and treatment weight of clippings (Fig. 1). Embark, especially at the higher rate, was most effective in reducing clipping weight during the second week following application. In fact, clipping weight was almost non-existent during the second week at 3.00 fl oz of Embark per 1000 ft^2. Clipping weights from Embark treated plots increased during the third week after treatment while the effects of Primo were similar during Weeks 2 and 3.

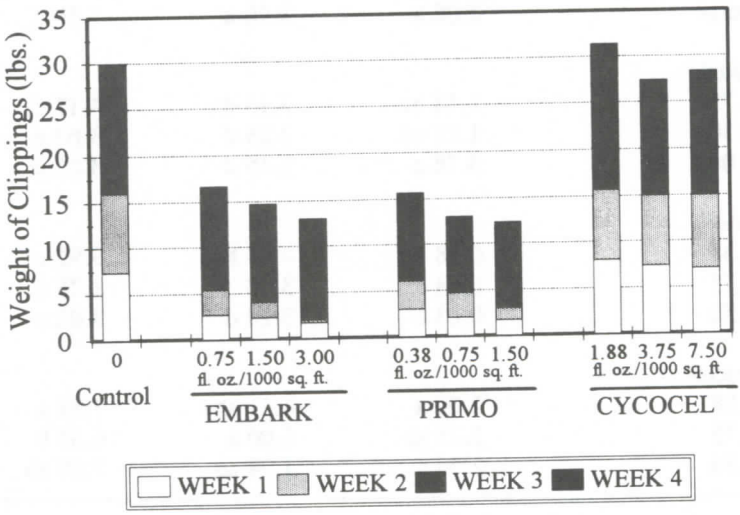

Figure 1. Interactive effects of time after application and treatment on weight of clippings, 1993. (LSD @ 0.05 = 2.48)

As can be seen from total bar height in Figure 1, Embark and Primo were equally effective in reducing total clipping weights by approximately 50% compared to the control and Cycocel treatments. However, clipping weights from Week 4 were similar for all treatments indicating that the effectiveness of both Embark and Primo was short-lived. Repeat applications of the plant growth retardants would be necessary for season-long control, and perhaps applications made earlier in the growing season would be more effective as suggested by Rogers et al. (1987).

The probability of reducing required mowing maintenance through use of Embark or Primo in landscape situations is good if uniform stands of single species turfs are used and if the species being treated is affected by the plant growth retardant. However, variability in species response can be high as evidenced by the differences between the bermudagrass and dallisgrass in this project. Under the conditions of this study using a mixed species turf, the number of mowings could not have been reduced significantly while maintaining a visually attractive landscape. No phytotoxic responses to the plant growth regulators were noted.

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