

Dimension Herbicide as a Potential Product for Pre-Emergence Poa Annua Control on Overseeded Bermudagrass Turf

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Abstract

Dimension herbicide (dithiopyr) was applied to common bermudagrass turf at 90, 60, and 45 days before fall overseeding to measure the efficacy for turf safety and for control of fall germinating POA Annua (PA). Applications were made at 0.25, 0.375, and 0.50 lbs. AI/A on each date. One half of each plot was overseeded, while the other half was not. Percent plot (PA) infestation and percent weed control was more greatly affected by the process of overseeding, than that of the herbicide applications alone. When not overseeded, the bermudagrass turf had a maximum of 45% PA control in November, which decreased dramatically to little or no control from January to March 2000. With the inclusion of ryegrass overseed, the high rate (0.50 lbs. AI/A) applied closest to the overseeding (45 DBOS) provided between 79-82% PA control over the length of the test. Actual infestation levels among non-chemical receiving control plots showed a 3X increased level in PA suppression due to overseeding, when compared to the non-overseeded, non-chemical controls. Dimension herbicide alone had little effect for PA control. When combined with overseeding, the 0.50 lb. AI/A rate, applied at 60 or 45 DBOS provided the greatest levels of PA control. The performance of Dimension on non-overseeded bermudagrass does not support the anticipated use of this chemical for PA control.

Introduction

Poa annua (PA) or annual bluegrass is the most problematic weed in turfgrass management. It can be controlled on established turfs with several pre-emergence herbicides, but the risk of affecting germination of other desirable turf grasses when required is a real risk. Such is the case when attempting to control PA with a pre-emergence herbicide previous or in concurrence with fall overseeding bermudagrass with perennial ryegrass in the southwest. A field study was conducted to evaluate rate and timing combinations of Dimension herbicide for (PA) pre-emergence control without interfering with overseed germination.

Materials and Methods

Dimension herbicide (dithiopyr) was applied at 0.250, 0.375 and 0.5 lbs AI/A at 90, 60 and 45 days before overseeding (DBOS), and as a single treatment at 0.50 lbs AI/A applied 45 days after overseeding (DAO). Treatments were applied to 5' x 6' plots with a Gandy drop spreader. The spreader was calibrated for applying the 0.27G formulation of Dimension. Plots were watered in by hand using a quick coupler 2.0" hose connection to insure incorporation. Application dates were July 10, August 9, and August 26, which were 90, 60 and 45 days (DBOS). Plots were then split with ryegrass overseed on September 29, 1999 at the rate of 16 lbs PLS of "Charger" ryegrass per 1000 ft². The remaining half plot remained unseeded. This arrangement allowed for evaluation of the Dimension alone (non-overseed) versus Dimension with overseed.

Each plot was replicated four times. Four control plots of both overseed and non-overseeded checks were included. The “overseed only” plots were used to calculate percent PA control for Dimension-overseed plots, while the “non-overseed no chemical” plots were used to calculate percent PA control for the non-overseeded chemically treated turf. Thus, herbicide and herbicide/overseed effects could be measured independently.

Poa annua infestations were assigned on a percent plot basis on November 16 and December 12, 1999 and January 24 and March 30, 2000. Percent PA control was calculated as 1- (treated/respective control). Plot composition included visual estimates of percent bermudagrass and ryegrass on October 18, November 16, and December 10. Turfgrass color and quality were assigned to plots during the November, December, January and March evaluations. Density values were assigned on December 10.

All data was subjected to the analysis of variance technique, using SAS software. Least significant difference (LSD) values were calculated as the mean separation statistic only when and if the F ratio for the treatment effect (rate/application date combinations) was significant at $P=0.05$, or less.

Results and Discussion

Overseeded bermudagrass - turf response:

On October 18, 1999 (19 DAOS), percent ryegrass and bermudagrass composition values were assigned to all plots. The percent plot ryegrass composition ranged from 80% to 88%, while percent plot bermudagrass ranged from 8% to 15% (Table 1). The treatment affect was non-significant. Dimension applied at 45 days (DBOS) had 80% to 84% ryegrass, regardless of rate. The greatest numerical amount of ryegrass occurred from Dimension treatments applied at 90 days (DBOS) (at 0.375 and 0.250 lb AI/A rates). The overall treatment rate was non-significant and the treated plots had the same ryegrass coverage as the checks. The percent bermudagrass was greatest among plots which had the lesser amounts of perennial ryegrass. This demonstrated a competitive effect, and not necessarily a herbicide effect (for percent plot bermuda regrowth after overseedings (Table 1). The remaining difference between the sum of the two grass plot covers represents straw and/or bare ground present. Again, no significant differences occurred (Table 1).

On November 16, 1999, no significant treatment main affect occurred for percent plot ryegrass, percent plot bermudagrass, but overseed turfgrass quality was affected by “treatments”. Percent ryegrass cover ranged from 72% to 86% (non-significant) as bermudagrass cover ranged from 8% to 13% ground cover (non-significant). All Dimension treatments applied within 45 days of actual overseeding had 77% to 72% cover ryegrass. Those plots with the most bermudagrass at the time included the 0.50 lb AI/A rate applied 45 days (DBOS) and the 0.250 lb AI/A rate applied 90 days (DBOS). This demonstrated a random response for percent bermudagrass, which was not related to treatments (Tables 1, 2).

Turfgrass quality scores ranged from 6 to 8 on November 16 (Table 3). Dimension applied to turf at 0.375 lbs AI/A at 90 days (DBOS) and at 0.50 lbs AI/A at 60 days (DBOS) had turf mean quality scores of 6. This exhibited no biological significance, however, in relation to overall timing and rate combinations if damage were to be realized to the new overseeding (Table 3). Dimension applied at the highest rate (of 0.50 lb AI/A) closest to overseeding (45 days DBOS) had turfgrass quality identical to that of the control (7.0). Turf which received the only post-emergence (this treatment applied on this day at 0.50 lb AI/A – at 45 days DAOS) ranked highest in turfgrass quality, with a mean score of 8.0, along with two other treated plots. Thus, quality was not affected by “treatments” (Table 3), and there was no biological trend for any turfgrass responses based on visual quality.

On December 10, 1999, the treatment affect was not significant for turfgrass color, density, percent plot ryegrass or bermudagrass (Tables 1, 2, 3). Percent ryegrass decreased on average compared to the previous month, due to the excessive growth of bermudagrass which occurred due to abnormally high temperatures. Bermuda ranged from 5% to 13% plot cover, and ryegrass cover ranged from 55% to 79% (Table 1). Overall density scores ranged from 6 to 7 (Table 3). Again, no biological response occurred for density or quality based on rate/timing treatment combinations (Table 3).

On January 27, 2000, the “treatment” main affect was significant for turfgrass quality, and color, but not for density. Mean quality scores ranged from 5 to 8. Dimension applied at 0.50 lbs AI/A at 45 days DBOS, produced a mean quality score of 8.0. Dimension treated turf at 90 days DBOS had scores of 5.0 or less, when applied at the low and middle rates (0.375 and 0.250 lb AI/A). This has no biological meaning as higher rates applied closer to overseeding should have produced the greatest turf responses. This was not realized (Table 3). The same rank order results occurred for density, as all 0.50 lb AI/A treatments had the highest density values, regardless of application timing (Table 3).

On March 20, 2000, the quality response was highly significant, but turfgrass color was not. The quality scores ranged from 4 to 7 for overseeded turf. Again, no biological rate/application timing responses were realized for overseed turf responses (Table 3). Perhaps regrowth stimulation after applications of Dimension made early in the summer required higher Nitrogen fertility.

Non-overseeded bermudagrass – turf response:

The percent plot bermudagrass and quality of non-overseeded bermudagrass plots was not affected by “treatments” (rates/application timings) of Dimension. All plots had some bermudagrass regrowth, but were inundated with PA (Table 5). Percent plot bermuda (for non-overseeded turfs) ranged from 86%, 56%, and 33% in October, November, and December, respectively (Table 2).

Weed Control

Weed control was calculated for both overseeded and non-overseeded turfs which received applications of Dimension. Weed control evaluation dates were November 16, December 10, January 27, and March 20 (Tables 4, 5).

Overseeded/Dimension Treated Turf:

The “treatment” affect was significant for *Poa annua* control for November 16, January 27, and for March 20 (Table 4). It was unusual to be able to see PA so readily in November, but extremely warm Fall temperatures enhanced PA expression (Table 4).

On November 16, 1999, actual percent plot infestations among overseed turf ranged from 3% to 18%, with the untreated overseed control showing 18% PA. Although this translated into 3% to 82% PA control among Dimension-treated, overseeded turf, a large part of the *Poa* reduction was due to overseeding competitive effects. This is based on the amount of *Poa annua* expressed in the non-overseeded vs. overseeded controls (Table 4, 5).

On November 16, 1999, all 3 rate applications, when applied 60 days before overseeding had the highest numerical weed control values (61-82%), which were rate dependent. Dimension applied at 90 days before overseeding had low levels of PA control on overseeded turf, ranging from 31% to 47% control (Table 4). It is unclear as to why treatments applied at 45 days DBOS exhibited NO control at 0.25 lb AI/A, and 58% PA control at the high rate of 0.50 lb AI/A (Table 4). A weaker ryegrass cover was not observed for this treatment (83% rye) at the November 16 rating, which would otherwise allow more PA invasion (speculative).

On December 10, actual plot infestation levels ranged from 5% to 24 % plot cover. The untreated controls (when overseeded) had 21% plot PA cover. Therefore, percent weed control ranged from 0% to 79%. All treatments applied 90 days before overseed had either no, or low levels of weed control (Table 4). Dimension applied 90 DBOS at 0.50 lb AI/A had 18% control, while the 0.25 lb AI/A applied 90 DBOS control had more PA than the overseed-only control. The greatest degree of control was achieved at 0.50 lb AI/A applied 60 days DBOS, followed by 0.375 lb AI/A applied at 45 days DBOS (Table 4). Perhaps weaker ryegrass from the 0.50 lb AI/A treatment applied at 45 days DBOS allowed more *Poa annua* (65% ryegrass only) (Table 1).

On January 27, 2000, overseeded Dimension treated turf had percent weed control mean scores of 0% to 84%. Actual PA infestation levels among overseeded turf ranged from 5% to 33% (Table 4). The non-treated overseeded check had a mean infestation level of 32% *Poa* cover. Plots treated with Dimension at 0.50 lb AI/A 45 days DBOS, as well as those at 0.375 lb AI/A 60 days DBOS, and those treated at 0.50 lb AI/A 60 days DBOS provided control within the 81% to 84% range (Table 4). Note however, that the effect of overseeding itself reduced overall PA levels alone by a factor of 3X, as the overseeded-only control averaged 32% PA plot cover (Table 4), while the non-overseed control averaged 94% PA plot cover (Table 5) at that time.

Final data were taken on March 20, 2000. Percent PA infestation levels ranged from 5% to 41% plot cover. Four treatments now had more PA than the check, which occupied 30% PA of the turf surface, on average (Table 4). The highest ranking treatment for percent PA control was that of the 0.50 lb AI/A rate, applied 45 days DBOS. This treatment had 83% control. The two remaining treatments which afforded any level of meaningful control were 0.50 lb AI/A applied 60 days DBOS, and 0.375 lb AI/A applied 60 days DBOS. All treatments applied at 90 days DBOS had no control at this time and the middle and high application rates had more PA present in the plot than in the control plots (Table 4).

Non-Overseed Dimension Treated Turf:

These plots (½ of the entire test) were devised to measure the response of the Dimension herbicide, without the competitive

effects of overseeding. For percent control of PA, the mean of the (non-overseeded, non-treated) check was used for the weed control calculation (Table 5).

Poa annua infestation levels were much larger among Dimension treated turf when not overseeded. On each of the four evaluation dates, percent plot PA infestation levels among Dimension treated turfs ranged from 14% to 54%, 41% to 83%, 71% to 95%, and from 84% to 100% PA, respectively (Table 5). This demonstrates that (1) Dimension herbicide did not provide a high level of pre-emergence activity on PA and that (2) the competitive effects of ryegrass overseeding provided greater suppression of PA than applying Dimension to non-overseeded bermudagrass.

The “treatment” affect for percent weed control of PA was significant on the first evaluation date only (November 16), and not on the remaining December 10, January 27 or March 20 evaluations (Table 5).

The greatest amount of weed control (for non-overseeded turf) appeared on November 11, with 60% PA control for the high rate applied latest in the summer (0.50 lb AI/A @ 45 days DBOS). This was followed by the 0.375 lb AI/A rate, applied at 45 and 60 days DBOS. These treatments had 45% and 41% PA weed control, respectively. There were several treatments which had more PA than the control, which included all treatments applied 90 days before the overseed plots were sown to ryegrass on September 29. That application date was July 10 (Table 5).

On and afterwards of December 10, 1999, percent weed control of PA diminished quickly. The top ranking plots for weed control provided very low levels of actual weed control, exhibiting 31%, 24%, and 14% weed control in December, January, and March, respectively. The highest rate of Dimension applied latest in the summer did not provide the greatest control. This was due most likely to the high levels of *Poa* present at the test site, and the low activity levels that Dimension exhibited on *Poa annua* when competition from perennial ryegrass was not present.

Conclusion

1. Based on these results derived from rate/timing applications practiced in 1999, it appears that Dimension would not be effective as a pre-emergence herbicide for *Poa annua* control in conjunction with overseeding.
2. This is due to a lack of herbicide activity exhibited on bermudagrass turf alone and (2) the fact that overseeding (competition) alone provided suppression greater than the herbicide did alone (by a factor on average of 3X).
3. When overseeding was practiced, the high rate of Dimension (0.50 lb AI/A) applied closest to overseeding (45 DBOS) maintained the greatest level of control. Still, PA was visible on 5% to 10% of the plot.
4. The single post emergence treatment of 0.50 lb AI/A at 45 days DAOS did not provide any post emergence activity of PA.

Table 1. Percent plot composition¹ of overseeded bermudagrass after applications of Dimension Herbicide for the pre-emergence control of Poa Annuua. Univ of Arizona, 1999-2000.

RATE lb. AI/A	TIMING ²	% rye 18-Oct	% berm	% rye 16-Nov	% berm	% rye 10-Dec	% berm
0.25	90 DBOS	85	13	77	13	64	13
0.25	60 DBOS	85	11	84	9	73	13
0.25	45 DBOS	80	15	74	8	64	11
0.375	90 DBOS	88	8	78	10	55	13
0.375	60 DBOS	84	10	83	11	73	13
0.375	45 DBOS	83	15	78	8	70	8
0.5	90 DBOS	84	13	83	8	70	5
0.5	60 DBOS	83	14	86	11	79	11
0.5	45 DBOS	80	11	76	13	73	8
0.5	45 DAOS	85	12	73	10	65	13
Non-Treated Control		84	11	72	9	61	11
MEAN ³		84	12	78	10	68	11
LSD VALUE ⁴		NA	5	NA	NA	NA	NA

¹ Percent ryegrass and bermudagrass of entire plot (0-100%). Values are the mean of four replications.

² DBOS = Number of days before overseeding. Overseeding date = Sept 29, 1999
DAOS = Number of days after overseeding. Overseeding date = Sept 29, 1999

³ Mean = Average of all treatments on each date

⁴ LSD Value = Mean separation statistic. Difference between two treatment means must be larger than the corresponding LSD value for treatments to be statistically different from each other. P level = 0.05.
N.A.= not applicable, since treatment main effect was not significant.

Table 2. Percent plot bermudagrass¹ after previous applications of Dimension herbicide for the pre-emergence control of *Poa annua* in conjunction with fall overseeding.² University of Arizona, 1999, 2000.

RATE ³	TIMING ⁴	RYE ⁵	berm	berm	berm
			18-Oct	16-Nov	10-Dec
0.25	90 DBOS	No	89%	44%	21%
0.25	90 DBOS	Yes	13%	12%	13%
0.25	60 DBOS	No	85%	68%	44%
0.25	60 DBOS	Yes	11%	9%	13%
0.25	45 DBOS	No	84%	40%	16%
0.25	45 DBOS	Yes	15%	8%	11%
0.375	90 DBOS	No	84%	43%	26%
0.375	90 DBOS	Yes	8%	10%	13%
0.375	60 DBOS	No	86%	61%	45%
0.375	60 DBOS	Yes	10%	11%	13%
0.375	45 DBOS	No	84%	59%	49%
0.375	45 DBOS	Yes	15%	8%	8%
0.50	90 DBOS	No	84%	51%	28%
0.50	90 DBOS	Yes	13%	8%	5%
0.50	60 DBOS	No	90%	63%	51%
0.50	60 DBOS	Yes	14%	11%	11%
0.50	45 DBOS	No	85%	70%	38%
0.50	45 DBOS	Yes	11%	13%	8%
0.50	45 DAOS	No	86%	39%	23%
0.50	45 DAOS	Yes	12%	10%	13%
Check		No	88%	52%	29%
Check		Yes	11%	9%	11%
OVERSEED MEAN ⁶			12%	10%	11%
NON-OVERSEED MEAN			86%	54%	33%

LSD OVERSEED⁷

5 NA NA

LSD NON-OVERSEED

NA 21 NA

¹ Percent plot bermudagrass (0-100%)

² Ryegrass applied as overseed, Sept 29, 1999

³ Rate of Dimension herbicide, lbs. ai/a

⁴ Number of days herbicide applied before overseeding = DBOS. Number of days after overseeding = DAOS

⁵ Rye yes = overseeding executed. Rye no = no overseed

⁶ Mean of all plots on each evaluation date

⁷ LSD Value = Mean separation statistic. Difference between two treatment means must be larger than the corresponding LSD value for treatments to be statistically different from each other. P level = 0.05.

N.A.= not applicable, since treatment main effect was not significant.

Table 3. Color¹, Quality and Density of Overseeded Bermudagrass after applications of Dimension Herbicide for the control of *Poa annua* in conjunction with fall overseeding. University of AZ, 1999-2000.

RATE lb. ai/a	TIMING ²	qual	density	quality	color	quality	density	color	quality
		16-Nov	10-Dec	10-Dec	27-Jan	27-Jan	27-Jan	20-Mar	20-Mar
0.25	90 DBOS	7	7	6	6	5	6	6	5
0.25	60 DBOS	7	6	6	6	5	5	6	5
0.25	45 DBOS	8	7	7	6	6	6	7	5
0.375	90 DBOS	6	6	6	5	5	6	6	4
0.375	60 DBOS	8	7	7	8	7	6	7	6
0.375	45 DBOS	8	7	7	6	6	6	6	5
0.5	90 DBOS	8	7	8	7	7	7	7	4
0.5	60 DBOS	6	7	6	7	7	7	7	7
0.5	45DBOS	7	7	7	8	8	7	7	7
0.5	45DAOS	8	6	6	6	6	7	6	5
Non-Treated Control ³		7	7	6	6	6	6	6	5
MEAN⁴		7	6	6	6	6	6	6	5
LSD VALUE⁵		NA	NA	NA	1.6	1.6	NA	NA	1

¹ Visual response scale, 1-9, 1= dead, 6 = acceptable, 9 = best possible condition

² Timing = # of days before actual overseeding of Sept 29, 1999

³ Mean of Overseeded - non herbicide treated turf

⁴ Mean of All plots for each evaluation date

⁵ LSD Value = Mean separation statistic. Difference between two treatment means must be larger than the corresponding LSD value for treatments to be statistically different from each other. P level = 0.05.

N.A.= not applicable, since treatment main effect was not significant.

Table 4. Percent infestation¹ and percent weed control² of *Poa annua* following applications of Dimension herbicide on overseeded bermudagrass, University of Arizona, 1999-2000.

RATE lb. AI/A	TIMING	Cover ¹ Control ²		Cover Control		Cover Control		Cover Control	
		16- Nov	39%	10- Dec	-13%	27- Jan	45%	20- Mar	8%
0.25	90 DBOS	11%	39%	24%	-13%	18%	45%	28%	8%
0.25	60 DBOS	7%	61%	14%	35%	14%	56%	21%	29%
0.25	45 DBOS	19%	-4%	17%	19%	18%	43%	31%	-4%
0.375	90 DBOS	13%	31%	18%	13%	29%	10%	41%	-38%
0.375	60 DBOS	6%	67%	12%	43%	5%	84%	8%	73%
0.375	45 DBOS	11%	42%	7%	67%	13%	61%	23%	25%
0.5	90 DBOS	10%	47%	17%	18%	23%	30%	34%	-13%
0.5	60 DBOS	3%	82%	5%	79%	6%	80%	6%	79%
0.5	45 DBOS	8%	58%	11%	46%	5%	84%	5%	83%
0.5	45 DAOS	18%	3%	15%	31%	33%	-2%	39%	-29%
Non-Treated Control		18%		21%		32%		30%	
MEAN ⁴		10%	43%	14%	34%	16%	49%	24%	21%
LSD VALUE ⁵		NR	56%	NR	NA	NR	22%	NR	25%

¹ Percent infestation = amount of plot covered with *Poa annua* (0-100%).

² Percent control = 1 - (treated infestation/overseed control infestation) x 100.

³ Non-treated control = overseeded with no herbicide treatments.

⁴ Mean of all plots for each evaluation date. Plots overseeded Sept. 29, 1999.

⁵ LSD Value = Mean separation statistic. Difference between two treatment means must be larger than the corresponding LSD value for treatments to be statistically different from each other. P level = 0.05.

N.A.= not applicable, since treatment main effect was not significant.

N.R.= not required, does not include adjustment for percent of weed control.

Table 5. Percent infestation¹ and percent weed² control of *Poa annua* following applications of Dimension herbicide on non-overseeded bermudagrass, University of Arizona, 1999-2000.

RATE lb. AI/A	TIMING	Cover Control 16-Nov		Cover Control 10-Dec		Cover Control 27-Jan		Cover Control 20-Mar	
		Cover	Control	Cover	Control	Cover	Control	Cover	Control
0.25	90 DBOS	49%	-43%	51%	15%	89%	5%	93%	4%
0.25	60 DBOS	21%	38%	41%	31%	78%	17%	93%	4%
0.25	45 DBOS	46%	-36%	83%	-38%	90%	5%	96%	1%
0.375	90 DBOS	46%	-36%	61%	-2%	82%	13%	91%	6%
0.375	60 DBOS	20%	41%	48%	21%	91%	3%	98%	-1%
0.375	45 DBOS	19%	45%	41%	31%	73%	22%	84%	14%
0.5	90 DBOS	39%	-14%	58%	4%	95%	-1%	99%	-2%
0.5	60 DBOS	21%	38%	43%	28%	71%	24%	90%	7%
0.5	45 DBOS	14%	60%	44%	27%	91%	3%	93%	5%
0.5	45 DAOS	54%	-58%	76%	-27%	95%	-1%	100%	-3%
Non-Treated Control ³		34%		60%		94%		97%	
MEAN ⁴		33%	3%	55%	9%	86%	9%	94%	4%
LSD VALUE ⁵		NR	18%	NR	NA	NR	NA	NR	NA

¹ Percent infestation = amount of plot covered with *Poa annua* (0-100%).

² Percent control = 1 - (treated infestation/non-overseed control infestation) x100.

³ Non-treated Control = No herbicide, no overseed

⁴ Mean = Mean of all plots for each evaluation date. Plots overseeded Sept. 29, 1999.

⁵ LSD Value = Mean separation statistic. Difference between two treatment means must be larger than the corresponding LSD value for treatments to be statistically different from each other. P level = 0.05.

N.A.= not applicable, since treatment main effect was not significant.

N.R.= not required, does not include adjustment for percent of weed control. For informational purposes only.