

Evaluation of Timing Applications of Ethephon and Trinexepac-Ethyl For Seed Head Suppression of Poa annua

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Abstract

Seed head production from Poa annua is problematic on winter turfs, whether they are overseeded or not. Flowering culms are unsightly, prevent a uniform surface, and insure a continuous crop of seeds for the future. A field test was conducted to evaluate the effects of PROXY and a PROXY/PRIMO PGR tank mix for seed head control. Treatments were applied on three different dates in order to evaluate the degree of response of treatments and help define treatment window applications for future programs.

PROXY when applied alone at 5 ounces/product/M produced a maximum of 60% seed head control at 26 days after a single application on February 15, and 83% seed head control at 27 days after a single application on March 1. A tank mix of PROXY/PRIMO (5.0/0.25 ounces/product/M) generally produced greater seed head control than PROXY alone. The tank mix produced seed head control effects quicker, greater, and longer than PROXY alone. Seed head suppression and percent seed head control was greatest when products were applied initially on either February 15 or March 1, 2001. PROXY/PRIMO produced the darkest color turf when applied on either February 15 or March 1. At least three tank mixes seem to be needed, applied monthly to suppress/control seed heads throughout the winter/spring season.

Introduction

Poa annua (annual bluegrass) is the most cosmopolitan winter weed in mowed turfgrass settings. This is true whether overseeding is practiced or not. Pre-emergence weed control of AB is problematic, due to its germination window (which conflicts with overseeding). After emergence, AB is competitive under close mowing conditions, is tolerant of traffic, and responds with increased vigor with increasing nitrogen fertilization when efforts are made to favor the competition of the desirable host turf species.

PGR's have been used with mixed success in controlling either plant competition, seed head suppression, or both. Seed head proliferation of AB is unsightly, produces a disruptive golf surface, and assures future annual propagation of the species. Tests conducted late in the spring of 2000 demonstrated some activity and partial suppression of AB seed heads applied to 100% purestands of AB when applied in April and early May. In these tests, 10 ounces of product per 1000 ft² caused greater seed head suppression than the 5 ounce (label) rate. With this in mind, a test was devised to determine:

- (1) the effects of ethephon [PROXY] and a tank mix of ethephon and trinexepac-ethyl [PRIMO] on seed head control, when
- (2) applied once on different initial application dates. This test would provide information on the importance of application date(s) on PGR efficacy for seed head suppression.

Materials and Methods

Two tee banks which had uniform stands of 100% AB were selected for the site of the test at Randolph Golf Course, Tucson, Arizona. The tee banks were mowed 3x weekly on a regular basis, at 7/8 inch with a tri-plex mower.

PGR plots were 20" x 48" each. Treatments were applied using a 8004E nozzle (single nozzle boom) on either February 5, March 1, or March 21. PROXY was applied at 5.0 ounces/product/M, and as a tank mix at the same rate including 0.25 ounces/product/M of PRIMO. All plots were un-mowed and un-irrigated for 24 hours after application. Each treatment appeared four times on each application-timing date, along with replicated untreated control plots.

Plots were rated weekly after application by assigning visible suppression scores to AB seed head (1-6, 1=no suppression, 4=moderate, 6=severe suppression). Scores of 6 indicated that all panicle branches remained inside the inflorescence culm.

Additionally, the number of visible seed heads showing at least one panicle branch were counted, using a 9x6 (54 square inch) template. Turfgrass color scores using the NTEP visual color estimates were assigned to plots on three dates. All plots were measured from four sub-samples/plot, with the average subjected to the analysis of variance technique. Bonferroni's protected LSD was utilized as the mean separation statistic, only when the P Value for the ANOVA "treatment" effect was significant at P=0.05, or less. LSD values were calculated across all cumulative treatments, as plot ratings after one, two, or three different application timings. Percent weed seed head control was calculated as a function of the mean of the untreated checks within each application timing block. Both table and figure formats are provided to illustrate treatment and trend differences due to PGR/timing applications.

Results and Discussion

AB seed head pressure was adequate throughout the entire test period, from February 20 to April 11 (Table 1). There were no differences in mean numbers of heads within control plots across response evaluation dates. Minimum actual seed head density ranged from 20.5 heads/sub-plot on February 20, to 63.6 heads/sub-plot on March 13. Flowering was generally greatest from early March to early April (Table 1).

Seed Head Suppression:

Within and Across Application Timings:

PROXY alone at the 5.0 ounce rate had minimal effect on seed head panicle suppression. Their values were quite similar to those of the control plots, when treatments were applied initially on February 15 (Table 2). The tank mix of PROXY/PRIMO caused true seed head suppression. Mean suppression scores ranged from 4.3 to 4.9 (1-6 scale) from February 20 to March 28 for the tank mix (Table 2). After that date, suppression (and percent weed control) decreased rapidly, for treatments initially applied on February 15. In fact, on April 4 and April 11, mean suppression scores for PROXY alone were less than that of the controls. This demonstrates a slight growth enhancement after the PGR effect was released [48 and 55 dat (1)]. (Table 2).

When applied initially two weeks later on March 1, PROXY alone exhibited greater visual suppression by 20 dat (2), on March 21, than when applied earlier in the season (February 15) at the same rate. The tank mix of PROXY/PRIMO exhibited strong seed head panicle suppression by 20 dat (2) on March 21, which carried through to the end of the test on April 11. PROXY alone exhibited strong suppression by 20 and 27 days after the March 1 treatment. (Table 2).

The last timing application for an "initial treatment" occurred on March 21, during the last third of the flowering season. On this date, non-treated controls had 61 and 49 heads per plot (Table 1). Seven days later [7 dat (3)] on March 28, suppression for the tank mix was 3.4, slightly greater than that of the other PROXY treatment, and the control. There was essentially no response in terms of enhanced seed head culm suppression by applying either PROXY alone or as a tank mix with PRIMO from the late season application (applied for the first time) which took place on March 21. From March 28 to April 11, mean

suppression scores for all treatments and the control ranged from 1.7 (low) to 3.4 (slight/moderate suppression).

In review, PROXY, when applied alone, produced the greatest amount of seed head culm suppression when it was applied on March 1, rather than earlier (February 15), or later (March 21). When applied as a tank mix with PRIMO, strong visual suppression occurred for up to 40 days after treatment, when applied early in the season (February 15) or in early-mid season (March 1). A single late season application of the tank mix was much less effective for all PGR treatments.

Percent Seed Head Control:

Within and Across Applications:

When applied “early” (February 15), PROXY alone at the 5.0 ounce rate exhibited 36.3%, 60.1% and 41% seed head control at 19, 26, and 34 days after treatment (Table 4, Figure 1). This decreased dramatically by 41 dat (1), exhibiting only 14.9% control. After that, PGR release caused greater amounts of AB in PROXY treated plots (Table 1), producing no control whatsoever (Table 4, Figure 1). The tank mix plots immediately demonstrated AB control, being 61.3% within 5 days after initial treatment [February 20, 5 dat (1)](Table 4). The tank mix produced better AB control, for up to 41 dat (1) (Table 4). The greatest % control was achieved by the tank mix on March 21 [34 dat (1)] with 81.5% weed control. After that, PGR release occurred, as was the case with PROXY alone (Table 4, Figure 1).

When applied “early-mid season” on March 1, both PROXY and the tank mix of PROXY/PRIMO had good control from 20-27 days after treatment. Mean percent AB control ranged from 73.2% to 93.9% at that time for both treatments, with the tank mix having a longer residual at 34 dat (2) (April 4). The tank mix had 65.2% control, while PROXY alone had 40.5% control at that time (Table 4, Figure 2).

When applied for the first time as a “late season” application on March 21, neither PGR treatment was effective. Percent AB seed head control ranged from 36.4% to only 36.5%, from March 28 to April 11 from the “late season” timing (Table 4, Figure 2). Note also that suppression was less at that time (Table 2), while the actual amount of seed heads per plot were the same across all non-treated controls, regardless of the “timing” block they were located in (Table 1). These trends show that “late season” applications are not as effective as earlier or early mid-season applications (Table 4, Figures 1,2), even though AB is still present past its peak flowering culm concentration (Table 1).

Turfgrass Color:

Within and Across Applications:

When applied “early” or “early-mid” season, the tank mix of PROXY/PRIMO produced a noticeably darker color turf than either PROXY alone, or the controls (Table 3).

As the untreated AB alone produced low turf color scores, the addition of PRIMO to the tank mix enhanced the overall color appearance following both the February 15, and March 1 applications, while PROXY alone increased color when applied March 1, and slightly to some extent when applied on March 21. This demonstrates the benefit of the tank mix in cooler weather, and that PROXY alone had some beneficial color effect when applied initially on March 1 (Table 3).

Based on these results, it is estimated that at least three applications of a tank mix may be needed to promote seed head suppression and seed head control. The “February 15” application of the tank mix provided 75% or greater AB seed head control longer than the March 1 application did, but the highest amount of control occurred 28 days after the March 1 treatment. Perhaps a tank mix every 28 days (3-4 applications) will sequester seed head suppression.

This program should be investigated for efficacy and turf tolerance of other grasses as well as for different mowing heights.

Conclusion

1. PROXY when applied alone at 5 ounces/product/M produced a maximum of 60% seed head control at 26 days after a single application on February 15, and 83% seed head control at 27 days after a single application on March 1.
2. A tank of PROXY/PRIMO (5.0/0.25 ounces/product/M) generally produced greater seed head control than PROXY alone.
3. The tank mix produced seed head control effects quicker, greater, and longer than PROXY alone. Maximum seed head control for the tank mix occurred 27 days after an application made on March 1 (94%).
4. Seed head suppression and percent seed head control was greatest when products were applied initially on either February 15 or March 1.
5. PROXY/PRIMO produced the darkest color turf when applied on either February 15 or March 1.
6. At least three tank mixes seem to be needed, applied monthly to suppress/control seed heads throughout the winter/spring season.

Table 1. Average number of *Poa annua* seed heads per 54 in², Spring 2001

Treatment	application date	20-Feb	27-Feb	6-Mar	13-Mar	21-Mar	28-Mar	4-Apr	11-Apr
		<i>5dat(1)</i>	<i>12dat(1)</i>	<i>19dat(1)</i>	<i>26dat(1)</i>	<i>34dat(1)</i>	<i>41dat(1)</i>	<i>48dat(1)</i>	<i>55dat(1)</i>
Non-treated control		20.5	36.2	45.3	63.6	61.2	52.1	44.6	36.6
Proxy @ 5.0 oz / 1000 ft ²	15-Feb-01	21.4	32.9	28.8	25.4	36.1	44.4	60.2	44.5
Proxy + Primo, 5.0 oz. + 0.25 oz.		7.9	18.3	12.3	21.1	11.3	19.8	52.0	40.8
Non-treated control		na	na	<i>5dat(2)</i> 23.0	<i>12dat(2)</i> 24.4	<i>20dat(2)</i> 49.4	<i>27dat(2)</i> 38.6	<i>34dat(2)</i> 30.4	<i>41dat(2)</i> 23.1
Proxy @ 5.0 oz / 1000 ft ²	1-Mar-01	na	na	29.1	24.3	13.3	6.3	18.1	21.9
Proxy + Primo, 5.0 oz. + 0.25 oz.		na	na	13.3	28.2	9.9	2.4	10.6	14.6
Non-treated control		na	na	na	na	na	<i>7dat(3)</i> 40.3	<i>14dat(3)</i> 29.7	<i>21dat(3)</i> 30.0
Proxy @ 5.0 oz / 1000 ft ²	21-Mar-01	na	na	na	na	na	33.3	23.4	19.1
Proxy + Primo, 5.0 oz. + 0.25 oz.		na	na	na	na	na	25.6	40.5	22.1
Test mean		16.6	29.1	25.3	31.2	30.2	29.2	34.4	28.0
LSD		9.5	7.9	7.9	22.6	17.6	14.7	14.4	11.0

Table 2. Average Poa annua seed head suppression, Spring 2001

Treatment	application date	20-Feb	27-Feb	6-Mar	13-Mar	21-Mar	28-Mar	4-Apr	11-Apr
		5dat(1)	12dat(1)	19dat(1)	26dat(1)	34dat(1)	41dat(1)	48dat(1)	55dat(1)
Non-treated control	15-Feb-01	3.5	2.4	1.7	1.6	2.1	2.2	2.3	2.5
Proxy @ 5.0 oz / 1000 ft ²		3.0	2.0	2.1	2.6	2.6	2.6	1.8	1.9
Proxy + Primo, 5.0 oz. + 0.25 oz.		4.5	4.9	4.4	4.0	4.6	4.3	2.5	2.6
Non-treated control	1-Mar-01	na	na	5dat(2) 2.3	12dat(2) 2.5	20dat(2) 1.7	27dat(2) 2.3	34dat(2) 2.3	41dat(2) 3.2
Proxy @ 5.0 oz / 1000 ft ²		na	na	1.8	1.9	4.1	5.4	3.4	3.8
Proxy + Primo, 5.0 oz. + 0.25 oz.		na	na	4.5	1.8	4.8	5.9	4.6	4.5
Non-treated control	21-Mar-01	na	na	na	na	na	7dat(3) 2.4	14dat(3) 1.7	21dat(3) 2.8
Proxy @ 5.0 oz / 1000 ft ²		na	na	na	na	na	2.6	3.1	3.2
Proxy + Primo, 5.0 oz. + 0.25 oz.		na	na	na	na	na	3.4	2.4	3.2
Test mean		3.7	3.1	2.8	2.4	3.3	3.5	2.7	3.1
LSD		1.29	0.72	0.86	1.40	0.97	1.10	0.97	0.99

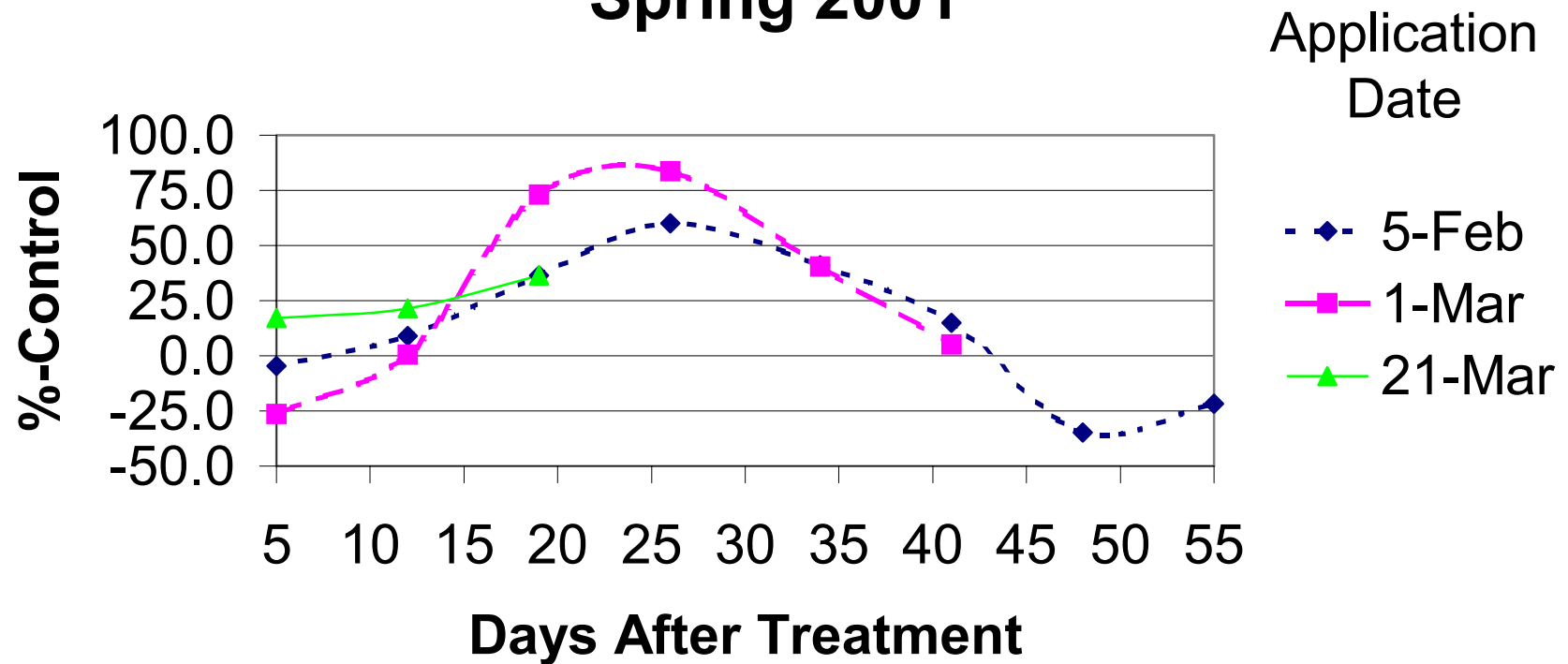
Table 3. Average Turfgrass Color, Spring 2001

Treatment	application date			
		28-Mar	4-Apr	11-Apr
Non-treated control	15-Feb-01	41dat(1) 4.8	48dat(1) 3.8	55dat(1) 4.8
Proxy @ 5.0 oz / 1000 ft ²		4.8	3.5	4.3
Proxy + Primo, 5.0 oz. + 0.25 oz.		6.8	3.8	4.5
Non-treated control	1-Mar-01	27dat(2) 4.3	34dat(2) 4.5	41dat(2) 4.5
Proxy @ 5.0 oz / 1000 ft ²		6.8	6.5	5.8
Proxy + Primo, 5.0 oz. + 0.25 oz.		7.8	7.5	6.8
Non-treated control	21-Mar-01	7dat(3) 4.5	14dat(3) 3.5	21dat(3) 3.0
Proxy @ 5.0 oz / 1000 ft ²		5.0	4.3	4.5
Proxy + Primo, 5.0 oz. + 0.25 oz.		5.3	4.8	5.3
Test mean		5.5	4.7	4.8
LSD		0.94	1.24	1.08

Table 4. Average Percent Poa annua Control (as a % of the non-treated check), Spring 2001

Treatment	application date	20-Feb	27-Feb	6-Mar	13-Mar	21-Mar	28-Mar	4-Apr	11-Apr
		<i>5dat(1)</i>	<i>12dat(1)</i>	<i>19dat(1)</i>	<i>26dat(1)</i>	<i>34dat(1)</i>	<i>41dat(1)</i>	<i>48dat(1)</i>	<i>55dat(1)</i>
Days After Treatment No. 1	15-Feb-01	<i>5dat(1)</i>	<i>12dat(1)</i>	<i>19dat(1)</i>	<i>26dat(1)</i>	<i>34dat(1)</i>	<i>41dat(1)</i>	<i>48dat(1)</i>	<i>55dat(1)</i>
Proxy @ 5.0 oz / 1000 ft ²		-4.6	9.0	36.3	60.1	41.1	14.9	-34.9	-21.7
Proxy + Primo, 5.0 oz. + 0.25 oz.		61.3	49.6	72.9	66.9	81.5	62.0	-16.5	-11.5
Days After Treatment No. 2	1-Mar-01	na	na	<i>5dat(2)</i>	<i>12dat(2)</i>	<i>20dat(2)</i>	<i>27dat(2)</i>	<i>34dat(2)</i>	<i>41dat(2)</i>
Proxy @ 5.0 oz / 1000 ft ²		na	na	-26.4	0.5	73.2	83.8	40.5	5.1
Proxy + Primo, 5.0 oz. + 0.25 oz.		na	na	42.1	-15.3	79.9	93.9	65.2	36.9
Days After Treatment No. 3	21-Mar-01	na	na	na	na	na	<i>7dat(3)</i>	<i>14dat(3)</i>	<i>21dat(3)</i>
Proxy @ 5.0 oz / 1000 ft ²		na	na	na	na	na	17.2	21.5	36.5
Proxy + Primo, 5.0 oz. + 0.25 oz.		na	na	na	na	na	36.5	-36.4	26.5
Test mean		28.4	29.3	31.3	28.0	68.9	51.4	6.6	12.0
LSD		60.8	28.9	35.2	60.0	11.2	28.8	36.5	38.5

**Figure 1. %-Poa annua Control - Proxy
@ 5 oz.,
Spring 2001**



**Figure 2. %-Poa annua Control -
Proxy @ 5 oz. & Primo @ 0.25 oz.,
Spring 2001**

