

Use of Select Herbicides for Pre and Post Emergence Control of Poa Annua When Overseeding Bermudagrass with Perennial Ryegrass

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Abstract

Overseeding bermudagrass turf with perennial ryegrass is essentially a standard practice in south western turfgrass maintenance. This practice complicates (and often negates) the pre-emergence control of Poa annua (PA) which germinates within the overseeding window. Outplay (mesotrione) was applied as pre, post and pre+post applications to control PA in golf turf (overseed on October 2, 2006). Outplay was applied with Trimit as a post emergence treatment. Barricade and Barricade + Monument were applied post emergence.

On non overseeded turf:

The greatest amount of (PA) weed control was achieved by the treatment of Barricade 16 ounce/product/acre (8WBOS) and Monument 16 gm (2WBOS) (Table 3). This treatment had no PA initially (2 November) 93% control on 17 November, and 7 December, 90% control on 4 January, dropping to 77% control by 16 February. Outplay applied pre-emergence as a sole treatment had little or no effect on PA, providing essentially no control. This was even true for the high rate of 16 ounces of product, applied 1 week before overseeding. Outplay applied both pre/post at eight ounces also had little effect on PA. The same was true for Outplay applied as two post emergence treatments [(8 + 8) or (16 + 16) ounce rates] (Table 3). Prograss had a maximum weed control of 50% on January 4, sixteen days after its repeat application of 64 ounce. The post emergence tank mix of Outplay and Trimit, followed by Trimit alone had a maximum of 50% (PA) weed control on January 4, which declined afterwards.

Overseeded Turf

Barricade and Barricade plus Monument had good control initially (94% 16 February), noting that the addition of Monument increased percent weed control by 10% in March (Table 8). Outplay applied alone as a pre-emergence product, had minimal control, with the high rate of 16 ounces applied 1 week before overseeding providing nominal weed control (65%, 41%, 58%) on 16 February, 15 March, 26 March, respectively. Outplay applied as a post emergence treatment only, exhibited good to moderate weed control, with the 16 and 16 ounce repeat treatments having better weed control than the 8 ounce plus 8 ounce treatments (applied 8 weeks and 12 weeks after overseeding, respectively). The 16 and 16 ounce treatment had 100%, 82% and 78% weed control on 16 February, 15 March, and 26 March, respectively (Table 8). Prograss applied twice as a post emergence provided similar levels of PA control (100%, 85%, 89%) on those same dates, respectively. Finally, when Outplay was applied as a post emergence treatment with Trimit, weed control was good to moderate, providing 88%, 67%, and 78% weed control on overseeded turfs on 16 February, 15 March, and 26 March, respectively (Table 8).

The affect of overseeding itself based on NTC means of overseeding and non-overseed turfs (no herbicides) showed that overseeding alone suppressed PA by 93% on 16 February, 91% on 15 March and 59% on 26 March.

Introduction

Poa annua, or “annual bluegrass”, hereafter as (PA), is the most cosmopolitan and troublesome grassy weed in winter turfgrass systems. It is easy to control in year-round cool season turfs, but overseeding bermudagrass with a perennial ryegrass in the late summer/early fall causes extreme limitations in the fact that pre-emergence herbicides affect the germination of the overseed species. Rubigan (fenarimol) has been used successfully for 25 years in this capacity, and in the last 5 years, Barricade (proflam) has been labeled for this use (to control PA with overseeding) by following specific rate ranges at either 6 or 8 weeks before overseeding (BOS). A test was conducted to determine the comparative efficacy of Outplay (mesotrione) applied as both a pre and post emergence treatment for PA weed control in overseeded bermudagrass. These treatments (Appendix Table A) were compared to select timing applications of Barricade (proflam), Monument (trifluralin), and Prograss (ethofumesate).

Materials and Methods

The test site was an irrigated golf course rough of common bermudagrass with a known history of PA in Green Valley, Arizona (35 miles south of Tucson). In mid June 2006, the entire test site was overseeded with PA at 2.0 lbs/M to promote uniformity of infestation. The test site was irrigated to prevent stress, and mowed 3x weekly at 1.0 inch with a tri-plex mower with clippings returned. Treatment dates for herbicide applications in 2006 were 4 August (8WBOS); 15 September (2WBOS); 22 September (1WBOS); 22 November (8WAS); and December 20 (12WAS). Plots were overseeded on October 2, 2006, with Charger II turf-type perennial ryegrass at the rate of 625 lbs PLS/A. Each plot was overseeded in half, while the other half remained bermudagrass. The entire plot (5'x6') was scalped before overseeding.

All plots were evaluated for applicable agronomic response variables (PA infestation used for percent weed control), injury to PA and percent plot composition. Overseeded plots were also rated for turfgrass color, quality, injury to the overseed turf, and density as applicable. Non-treated controls were included in each of five (5) randomized complete blocks, as both overseeded and non-overseeded checks. Percent plot infestation levels were recorded and used for percent weed control using the respective control plot infestations on a per-replication basis, being expressed as percent control. Data was analyzed as two separate RCB designs (with/without overseed) since the interaction of herbicide x overseed is of minor consequence to the main objective of the selected treatments being used in an overseed program. The evaluation of the same identical treatments without overseeding is used for demonstrating the affect that actual overseeding may have on PA suppression. This was assessed by observing the NTC plots of overseeded and non-overseeded turfs alone, rather than observing main affect means from a split plot analysis (which averages the main affect over all treatments).

LSD values were calculated only when the F ratio for the mean square of the “treatment” source of variation occurred at a P value of 0.05, or less. Treatments whose mean values differ in absolute values greater than the LSD value, are significantly different from each other.

Results and Discussion

Non Overseeded Turf:

Both plot halves (entire plot) were identically prepared for overseeding by repeated scalping and light vertical mowing after irrigation reductions prior to overseeding on October 2, 2006. On 7 December, the percent straw bermudagrass after frosts ranged from 72% to 98% among treated turfs (Table 1). The NTC averaged 73% dormant bermudagrass straw at that time. Basically, Barricade plots had the greatest amounts of straw (94-98%). The three Outplay treatments which were applied before overseeding (as a single treatment only) had the lowest amounts of visible straw (66-76%) (Table 1). The bleaching typical of bermudagrass from mesotrione was now gone and the remaining turf other than the dormant bermudagrass was now *Poa annua* (Table 3).

Injury to PA was assigned to plots on 7 December, 13 December and 4 January (Table 2). Degree of injury scores were assigned using a visual scale as follows: 1.0 = no injury, 4.0 moderate injury, while 6 = death. The percentage of the existing *Poa annua* (in the plot regardless of the absolute amount of *Poa annua* cover present) showing any visual injury ranged from 2% to 64% throughout the test. Injury to the NTC occurred from flag leaf necrosis at early flowering in January.

There was not much visible injury affect from either Barricade treatment, or for the “single Outplay pre-emergence treatments. The Barricade had very little visible injury on PA, while the three one-time Outplay applications applied pre-emergence to overseeding had 24-34% actual PA plot infestation cover, with no visible injury symptoms (7 December) (Table 3). On the non-overseeded turf, damage to PA from what was from a single application of Outplay (43-49%), occurred at 8 weeks post overseeding (Dec 2) (Table 2). This response was similar to the Outplay and Trimit tank mix (also applied once to date) which had 53% of its PA showing a slight/moderate injury (2.8) (Table 2).

On 13 December, there was no injury to existing PA from any of the pre-emergence treatments (all applied before overseeding), noting a similar response by the Outplay post emergence treatments which showed damage one week before. Not that the up front tank-mix of Outplay @ 16 ounces/P/A had the most visible injury to PA on 13 December (64% of all of its entire amount of *Poa* showing injury : mean = 4.2) (Table 2).

On January 4, the post emergence Outplay treatments which were applied at 8.0 oz/product 8 weeks post overseed and again at 12 weeks post overseed , along with the 16 ounce product rate (same timings) caused the greatest injury to PA [(2.6 degree /44% ; 2.8 degree / 41%] respectively (Table 2).. The tank mix of Outplay at 16 ounce/8WAOS plus Trimmit followed by another application of Trimmit, had 39% of its PA injured, slight to moderately in degree (2.8) (Table 2). Injury to PA on the NTC turf on January 4 was from flag leaf tip shredding and radial stem shredding of flowering culm shoots.

Percent PA control was determined on seven dates from 2 November 2006, to 26 March 2007 (Table 3). Both the amount of PA infestation levels (0-100% for the plot surface with PA) and percent weed control were statistically significant on all seven dates (Table 3). The NTC controls progressed from 4% (PA) cover on 2 November, to 27% cover on 7 December, and to 94% (PA) cover on 16 March. Therefore (PA) pressure was intense and adequate. The greatest amount of (PA) weed control was achieved by the treatment of Barricade 16 OUNCE (8WBOS) and Monument 16 gm (2WBOS) (Table 3). This treatment had no PA initially (2 November) 93% control on 17 November and 7 December, 90% control on 4 January, dropping to 77% control by 16 February (Table 3).

While percent weed control was based on percent plot infestation levels of 3.5% to 8.8% across all treatments on 2 November, percent weed control on 17 November was based on percent plot infestation levels ranging from 8-13% (Table 3). PA quickly advanced from 17 November to 7 December, 2006, and again from 4 January to 16 February, 2007. At each evaluation date, the addition of Monument to Barricade at 16 ounce rate improved weed control by 10-20%, on average over that of Barricade alone (Table 3).

Outplay applied pre-emergence as a sole treatment had little or no affect on PA, providing essentially no control. This was even true for the high rate of 16 ounces of product, applied 1 week before overseeding (Table 3).

Outplay applied both pre/post at eight ounces also had little effect on PA. The same was true for Outplay applied as two post emergence treatments [(8 + 8) or (16 + 16) ounce rates] (Table 3). Prograss had a maximum weed control of 50% on January 4, sixteen days after its repeat application of 64 ounce (Table 3).

The post emergence tank mix of Outplay and Trimmit, followed by Trimmit alone had a maximum of 50% (PA) weed control on January 4, which declined afterwards (Table 3).

All treatments had very little weed control by the end of March (-4 to 21%), and the non-seeded NTC averaged 94% PA cover.

When not overseeded, no treatments at the rates / timings practiced here, maintained high levels of season wide control. Barricade (pre) followed by Monument (pre) had the best weed control. Outplay applied before overseed as a single application (regardless of rate or timing) produced none to minimal PA weed control. As a post

emergent, Outplay had minimal control when used as a follow up treatment to an Outplay pre-emergence treatment, or as twin applications used as a post emergence. Outplay plus Trimmit, followed by Trimmit alone produced moderate PA weed control. Doubling the rate of Outplay did not dramatically increase weed control in either pre or post emergence scenarios.

Overseeded Turf

The “treatments” were overseeded on October 2, 2006 at the rate of 625 PLS/A. Vigor scores of plots just prior to mowing on 10 October (8DAOS) showed a trend in which there was a mild stunting (via unmowed turf height observations) from Outplay, which was no greater in affect than that of Barricade or Barricade plus Monument (Table 4).

Turfgrass color scores were assigned on three dates, with the “treatment” mean square being statistically significant on two dates during cold weather (7 December and 4 January) (Table 4). Both Barricade treatments had good color, without any DNA hangover. All three Outplay treatments applied before overseeding had satisfactory color throughout the test, as did (the 8 ounce pre plus 8 ounce) post Outplay treatment. Color was slightly less for this treatment on 7 December, with a mean color score of 5.8 (16 days after the second application/post emergence). This was short-lived (Table 4).

Both treatments of Outplay which featured two post applications of 8 ounce post (8WAOS) / 8 ounce post (12WAOS) and 16 ounce post (8WAOS) and 16 ounce post (12WAOS), exhibited lighter color turfs on 7 December and on 4 January (Table 4). The 16 ounce rate (applied for the first time 16 days previously) produced a light color turf (4.0) (Table 5), while the 8 ounce rate (applied once for the first time 16 days earlier as well) had a mean color score of 5.6 (Table 4). On January 4th, these same two respective treatments averaged mean color scores of 5.4 and 6.0, exhibiting a mild negative rate response, with enhanced turf color later on February 16 (Table 4).

Percent plot composition scores were assigned on overseeded turfs from 18 October until 26 March. There was no “treatment effect” for the percent plot ryegrass on 18 October (88% – 94% ryegrass among all treatments), however, on 26 October, the Barricade and Monument combination had the least amount of ryegrass cover (86%), while the NTC had 94% cover (Table 5).

As mesotrione bleaches actively growing bermudagrass, there was no affect on the Fall regrowth of bermuda which usually accompanies the ryegrass grow-in. The “pre” Outplay treatments had the same percent plot bermudagrass on October 26 as did those plots which were yet to receive their “post” applications (Table 5).

As was the case on 26 October, the Barricade / Monument pre-emergence treatment had slightly less cover on 2 November (of ryegrass and Poa) at 90%. The NTC overseed averaged 95% ryegrass and PA (Table 5).

On December 7, (16 days after the 8 week post emergence treatment was applied), the high rate of Outplay (16.0 + 16.0 ounce) had the lowest ryegrass cover (88%) and the highest amount of dormant bermuda (straw) showing at 12% (Table 5). Outplay @ 16 ounces plus Trimmit (applied once only to date) followed closely, with 90% ryegrass and 10% straw cover. Both of these treatments had 16.0 ounces/A of Outplay applied 16 days previous to this evaluation (Table 5).

For the 16 February and both March evaluations, the percent ryegrass cover was statistically significant, due solely to the amount of PA in the plot (Tables 5 ,3). Turfgrass quality scores were assigned to plots on six dates, with the “treatment” effect being significant once on 7 December after hard frosts had occurred where treatment means ranged from 4.4– 7.8 (Table 6).

Both Barricade treatments had mean quality scores of 6.0 or greater with one exception on 26 October, where the Barricade plus Monument treatment averaged 5.8. (Table 6). All three pre-emergence single treatments of Outplay had very good quality, (independent of PA infestations later on).

The post emergence only treatments of Outplay on December 7 had mean quality scores of 5.4 and 4.4, for the 8 and 16 ounce application (then applied once, 16 days previously) (Table 6). After that, both the sequential post applied 8 and the 16 ounce rate (applied for the second time at 12WAOS) had fully acceptable turfgrass quality.(Table 6).

Prograss applied twice post emergence had fully acceptable quality turf throughout the test. The inclusion of Trimmit with Outplay caused a decrease in quality (5.2 on 7 December) after a single application, followed by continued lower quality turf after additional Trimmit was applied alone 12 weeks after overseeding (Table 6). The resultant turf averaged 5.2 and 4.2 for quality on 4 January (16 days after the 12WAOS application) and 16 February (59 days after the 12WAOS application), respectively (Table 6).

Injury assessment to PA alone was assigned to plots on four occasions from 7 December to 16 February. Both the degree (magnitude of expression) and the percent of the entire existing Poa amount showing injury were significant responses to the treatment effect in all cases (Table 7). Barricade and Barricade / Monument treated turfs had no visible injury, with injury appearing on 16 February as flag leaf firing and radial flower culm shredding. The same was true for all three solo pre-emergence treatments of Outplay. The combination treatment of 8 ounce pre plus 8 ounce post Outplay caused some visible damage to PA plants.

When receiving only its first treatment series, the 16 ounce rate of Outplay had more damage on PA (3.4) than the 8 ounce rate (2.2) on 13 December (Table 7). After the respective tandem applications (same rates) were applied, the difference between these two treatments was minimized (2.0 vs 2.6) on 4 January (Table 7). Prograss treated turf showed no phenotypic injury to PA, although it did have some percent weed control. Outplay and Trimmit caused

visible injury to 29% of its PA population on 13 December, and when Trimmit alone was added as the sequential treatment, the injury to PA increased (4.0 degree : 33% of the existing *Poa annua*) on 16 February (Table 7). Again, note that the percentage of PA showing injury is based not on the total amount of PA in the plot, but the proportion of all the PA in a plot that was showing injury expression.

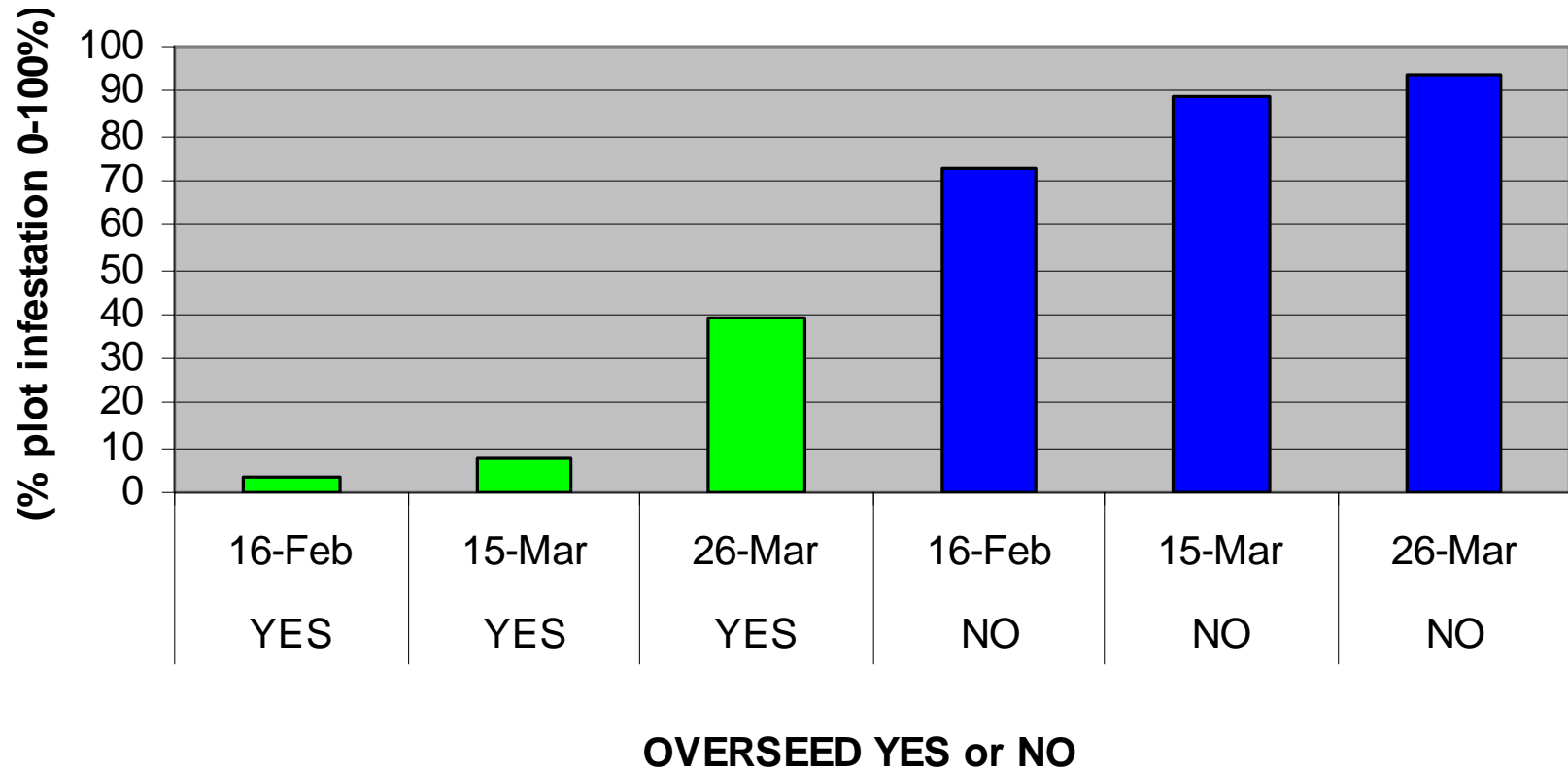
The percent weed control (calculated from PA infestation amounts /per plot) showed significance for the “treatment” mean square on all evaluation dates. The NTC averaged 3%, 8%, and 39% PA infestation levels on 16 February, 15 March, and 26 March, respectively (Table 8). Note again the NTC value in each field block (replication) was used for the respective percent weed control for the treatment plot in the same replication (not the average of all five NTC plots). The PA was not detectable in the fall and early winter until differentials in leaf color and flowering culms began expression starting with the return of “warmer” weather in early February.

Barricade and Barricade plus Monument had good control initially (94% 16 February), noting that the addition of Monument increased percent weed control by 10% in March (Table 8). Outplay applied alone as a pre-emergence product, had minimal control, with the high rate of 16 ounces applied 1 week before overseeding providing nominal weed control (65%, 41%, 58%) on 16 February, 15 March, 26 March, respectively (Table 8). Note that on 15 March, the “average” PA plot infestation was 8% among the five NTC plots, but clearly evident and detectable otherwise. Outplay applied at 8 ounces as both a pre and post emergence (16 ounce total) also had nominal percent weed control of PA. Maximum weed control for this treatment was 62% on 26 March (15% PA in the plot) (Table 8). Outplay applied as a post emergence treatment only, exhibited good to moderate weed control, with the 16 and 16 ounce repeat treatments having better weed control than the 8 ounce and 8 ounce treatments (applied 8 weeks and 12 weeks after overseeding, respectively) (Table 8). The 16 and 16 ounce treatment had 100%, 82% and 78% weed control on 16 February, 15 March, and 26 March, respectively (Table 8). Prograss applied twice as a post emergence provided similar levels of PA control (100%, 85%, 89%) on those same dates, respectively. Finally, when Outplay was applied as a post emergence treatment with Trimmit, weed control was good to moderate, providing 88%, 67%, and 78% weed control on overseeded turfs on 16 February, 15 March, and 26 March, respectively (Table 8).

Based on this data, perhaps Barricade/Monument pre-emergence, followed by 8.0 ounce and 16 ounce rate of Outplay should be investigated in an effort to provide season long control of PA in overseeded turfs. The Barricade /Monument treatment had only a slight decrease in visual density compared to other desirable treatments on Nov 2, 2006 (Table 9).

The test site had uniform and heavy PA infestation pressure (Fig 1). The affect of overseeding itself based on NTC means of overseeding and non-overseed turfs (no herbicides) shows that overseeding alone suppressed PA by 93% on 16 February, 91% on 15 March and 59% on 26 March. (Figure 2). Still, if PA is to be reduced for appearance and seed reservoir depletion purposes, season long control is needed since PA is a prolific seed producer.

**Fig. 1. %(PA) Plot Infestation Level as Influenced by Overseeding. U/A ,
2007. Outplay - PA overseeding trial.**



**Fig. 2. Percent Suppression from Overseeding Alone. U/A
2007. Outplay - PA /overseeding trial.**

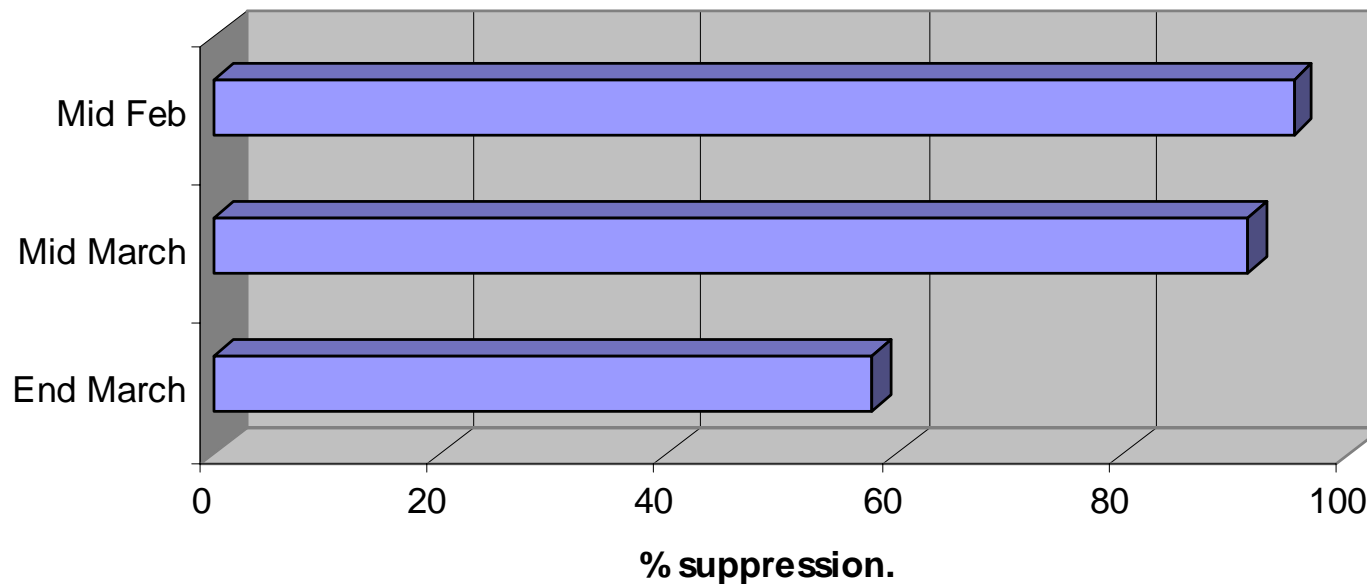


Table 1. Syngenta Poa at Green Valley Country Club - fall 2006 to spring 2007.

The University of Arizona, Tucson AZ.

Canopy composition - %-cover.

Non-overseeded

| | | | | |
|---|----------|------------------|--------|------------------|
| Days after 8 pre | 126 | 224 | | 235 |
| Days after 2 pre | 84 | 182 | | 193 |
| Days after 1 pre | 77 | 175 | | 186 |
| Days after 8 post | 16 | 114 | | 125 |
| Days after 12 post | - | 86 | | 97 |
| Days after overseed | 67 | 165 | | 176 |
| | - 2006 - | ----- 2007 ----- | | |
| | 7-Dec | 15-Mar | | 26-Mar |
| Treatment | % Straw | %-berm | %-berm | %-non-flower Poa |
| Barricade@16oz (8pre) | 93.8 | 34.0 | 20.0 | 26.0 |
| Barr@16oz(8pre)+Mon@16gm(2pre) | 98.4 | 64.0 | 26.0 | 30.0 |
| Outplay@8oz (2pre) | 66.0 | 4.0 | 1.0 | 2.2 |
| Outplay@8oz (1pre) | 72.0 | 10.4 | 7.4 | 5.6 |
| Outplay@16oz (1pre) | 76.0 | 13.4 | 2.0 | 6.4 |
| Otply@8oz(1pre)+Otply w/NIS@8oz(8post) | 72.0 | 9.0 | 4.0 | 4.2 |
| Otply@8oz w/NIS(8post)+Otply@8oz w/NIS(12post) | 79.6 | 14.0 | 5.0 | 13.0 |
| Otply@16oz w/NIS(8post)+Otply@16oz w/NIS(12post) | 80.0 | 12.4 | 7.0 | 10.0 |
| Pgras@64oz(8post)+Pgras@64oz(12post) | 70.6 | 22.0 | 6.4 | 10.0 |
| Otply@16oz w/NIS+Trimt@8oz(8post)+Trimt@8oz(12post) | 84.2 | 27.0 | 10.4 | 15.2 |
| NTC | 72.6 | 11.0 | 6.0 | 6.6 |
| Test mean | 78.7 | 20.1 | 8.7 | 11.7 |
| LSD | 13.9 | 19.3 | 14.8 | ns |

Table 2. Syngenta Poa at Green Valley Country Club - fall 2006 to spring 2007.

The University of Arizona, Tucson AZ.

Degree & percent plot injury

Non-overseeded

| | | | |
|---|------------------|--------|------------------|
| Days after 8 pre | 126 | 132 | 154 |
| Days after 2 pre | 84 | 90 | 112 |
| Days after 1 pre | 77 | 83 | 105 |
| Days after 8 post | 16 | 22 | 44 |
| Days after 12 post | - | - | 16 |
| Days after overseed | 67 | 73 | 95 |
| | ----- 2006 ----- | | ----- 2007 ----- |
| | 7-Dec | 13-Dec | 4-Jan |
| Treatment | injury (poa) | | injury (poa) |
| | degree | % | degree |
| Barricade@16oz (8pre) | 1.0 | 0.0 | 1.0 |
| Barr@16oz(8pre)+Mon@16gm(2pre) | 1.0 | 0.0 | 1.0 |
| Outplay@8oz (2pre) | 1.0 | 0.0 | 1.2 |
| Outplay@8oz (1pre) | 1.2 | 2.0 | 1.6 |
| Outplay@16oz (1pre) | 1.0 | 0.0 | 1.0 |
| Otply@8oz(1pre)+Otply w/NIS@8oz(8post) | 3.0 | 47.0 | 3.4 |
| Otply@8oz w/NIS(8post)+Otply@8oz w/NIS(12post) | 2.8 | 49.0 | 3.0 |
| Otply@16oz w/NIS(8post)+Otply@16oz w/NIS(12post) | 2.6 | 43.0 | 4.0 |
| Pgras@64oz(8post)+Pgras@64oz(12post) | 1.2 | 5.0 | 1.0 |
| Otply@16oz w/NIS+Trimt@8oz(8post)+Trimt@8oz(12post) | 2.8 | 53.0 | 4.2 |
| NTC | 1.0 | 5.0 | 1.0 |
| Test mean | 1.7 | 18.5 | 2.0 |
| LSD | 0.9 | 16.9 | 1.0 |

Table 3. Syngenta Poa at Green Valley Country Club - fall 2006 to spring 2007.

The University of Arizona, Tucson AZ.

Percent plot Poa Annuua & %-Poa control

Non-overseeded

| | | | | | | | |
|---|---------------------------|----------------------------|---------------------------|---------------------------|----------------------------|----------------------------|----------------------------|
| Days after 8 pre | 91 | 106 | 126 | 154 | 197 | 224 | 235 |
| Days after 2 pre | 49 | 64 | 84 | 112 | 155 | 182 | 193 |
| Days after 1 pre | 42 | 57 | 77 | 105 | 148 | 175 | 186 |
| Days after 8 post | - | - | 16 | 44 | 87 | 114 | 125 |
| Days after 12 post | - | - | - | 16 | 59 | 86 | 97 |
| Days after overseed | 32 | 47 | 67 | 95 | 138 | 165 | 176 |
| | ----- 2006 ----- | | | ----- 2007 ----- | | | |
| Treatment | <u>2-Nov</u> %-Control | <u>17-Nov</u> %-Control | <u>7-Dec</u> %-Control | <u>4-Jan</u> %-Control | <u>16-Feb</u> %-Control | <u>15-Mar</u> %-Control | <u>26-Mar</u> %-Control |
| Barricade@16oz (8pre) | 77.3 (1.0) | 82.2 (1.6) | 77.4 (6.2) | 67.8 (13.2) | 58.7 (30.0) | 25.8 (66.0) | 14.9 (80.0) |
| Barr@16oz(8pre)+Mon@16gm(2pre) | 100.0 (0.0) | 93.3 (0.6) | 94.2 (1.6) | 89.8 (4.2) | 76.6 (17.0) | 59.6 (36.0) | 21.3 (74.0) |
| Outplay@8oz (2pre) | -95.5 (8.6) | -44.4 (13.0) | -24.1 (34.0) | -51.2 (62.0) | -11.6 (81.0) | -7.9 (96.0) | -5.3 (99.0) |
| Outplay@8oz (1pre) | -9.1 (4.8) | -17.8 (10.6) | -2.2 (28.0) | -18.5 (48.6) | 7.7 (67.0) | -0.7 (89.6) | 1.5 (92.6) |
| Outplay@16oz (1pre) | 22.7 (3.4) | 6.7 (8.4) | 12.4 (24.0) | -2.4 (42.0) | 3.6 (70.0) | 2.7 (86.6) | -4.3 (98.0) |
| Otply@8oz(1pre)+Otply w/NIS@8oz(8post) | -72.7 (7.6) | -48.9 (13.4) | -2.2 (28.0) | -19.5 (49.0) | -3.3 (75.0) | -2.2 (91.0) | -2.1 (96.0) |
| Otply@8oz w/NIS(8post)+Otply@8oz w/NIS(12post) | -40.9 (6.2) | -46.7 (13.2) | 25.5 (20.4) | -3.9 (42.6) | 7.7 (67.0) | 3.4 (86.0) | -1.1 (95.0) |
| Otply@16oz w/NIS(8post)+Otply@16oz w/NIS(12post) | -4.5 (4.6) | -33.3 (12.0) | 27.0 (20.0) | 19.5 (33.0) | 17.4 (60.0) | 1.6 (87.6) | 1.1 (93.0) |
| Pgras@64oz(8post)+Pgras@64oz(12post) | -22.7 (5.4) | -64.4 (14.8) | -7.3 (29.4) | 18.5 (33.4) | 51.8 (35.0) | 12.4 (78.0) | 0.4 (93.6) |
| Otply@16oz w/NIS+Trimt@8oz(8post)+Trimt@8oz(12post) | -4.5 (4.6) | -13.3 (10.2) | 42.3 (15.8) | 49.8 (20.6) | 36.6 (46.0) | 18.0 (73.0) | 4.7 (89.6) |
| NTC | - (4.4) | - (9.0) | - (27.4) | - (41.0) | - (72.6) | - (89.0) | - (94.0) |
| Test mean | -5.0 4.6 | -8.7 9.7 | 24.3 21.3 | 15.0 35.4 | 24.5 56.4 | 11.3 79.9 | 3.1 91.3 |
| LSD | 83.5 3.5 | 80.3 7.2 | 49.3 13.9 | 41.9 17.7 | 30.3 21.2 | 22.4 19.3 | 16.3 14.8 |

Note: negative percent control indicates greater amounts of Poa were present than on the UTC.

** Value in parenthesis are of the actual percent plot Poa present.

Table 4. Syngenta Poa at Green Valley Country Club - fall 2006 to spring 2007.

The University of Arizona, Tucson AZ.

Vigor & Color

Overseeded with ryegrass

| | | | | |
|---|------------------|-------|------------------|--------|
| Days after 8 pre | 68 | 126 | 154 | 197 |
| Days after 2 pre | 26 | 84 | 112 | 155 |
| Days after 1 pre | 19 | 77 | 105 | 148 |
| Days after 8 post | - | 16 | 44 | 87 |
| Days after 12 post | - | - | 16 | 59 |
| Days after overseed | 9 | 67 | 95 | 138 |
| | ----- 2006 ----- | | ----- 2007 ----- | |
| | 10-Oct | 7-Dec | 4-Jan | 16-Feb |
| Treatment | Vigor | Color | Color | Color |
| Barricade@16oz (8pre) | 2.4 | 7.0 | 6.6 | 6.6 |
| Barr@16oz(8pre)+Mon@16gm(2pre) | 2.0 | 6.4 | 6.4 | 6.4 |
| Outplay@8oz (2pre) | 2.6 | 7.0 | 6.8 | 6.0 |
| Outplay@8oz (1pre) | 2.4 | 6.0 | 6.6 | 5.8 |
| Outplay@16oz (1pre) | 3.2 | 6.4 | 6.2 | 5.8 |
| Otply@8oz(1pre)+Otply w/NIS@8oz(8post) | 3.6 | 5.8 | 6.6 | 6.2 |
| Otply@8oz w/NIS(8post)+Otply@8oz w/NIS(12post) | 4.2 | 5.6 | 6.0 | 6.4 |
| Otply@16oz w/NIS(8post)+Otply@16oz w/NIS(12post) | 3.2 | 4.0 | 5.4 | 6.8 |
| Pgras@64oz(8post)+Pgras@64oz(12post) | 3.6 | 6.8 | 7.0 | 6.4 |
| Otply@16oz w/NIS+Trimt@8oz(8post)+Trimt@8oz(12post) | 3.8 | 4.6 | 4.0 | 5.6 |
| NTC | 3.0 | 6.4 | 6.6 | 5.6 |
| Test mean | 3.1 | 6.0 | 6.2 | 6.1 |
| LSD | ns | 0.6 | 1.0 | ns |

| Table 5. Syngenta Poa at Green Valley Country Club - fall 2006 to spring 2007. | | | | | | | | | | |
|--|------------------|--------|--------|-----------|-----------|------------------|---------|--------|--------|--------|
| The University of Arizona, Tucson AZ. | | | | | | | | | | |
| Canopy composition | | | | | | | | | | |
| Overseeded with ryegrass | | | | | | | | | | |
| | | | | | | | | | | |
| Days after 8 pre | 76 | 84 | 91 | 106 | 126 | 197 | 224 | 235 | | |
| Days after 2 pre | 34 | 42 | 49 | 64 | 84 | 155 | 182 | 193 | | |
| Days after 1 pre | 27 | 35 | 42 | 57 | 77 | 148 | 175 | 186 | | |
| Days after 8 post | - | - | - | - | 16 | 87 | 114 | 125 | | |
| Days after 12 post | - | - | - | - | - | 59 | 86 | 97 | | |
| Days after overseed | 17 | 25 | 32 | 47 | 67 | 138 | 165 | 176 | | |
| | ----- 2006 ----- | | | | | ----- 2007 ----- | | | | |
| | 18-Oct | 26-Oct | | 2-Nov | 17-Nov | 7-Dec | | 16-Feb | 15-Mar | 26-Mar |
| Treatment | %-rye | %-rye | % Berm | %-rye+poa | %-rye+poa | %-rye | % Straw | % -rye | | |
| Barricade@16oz (8pre) | 92.2 | 92.6 | 7.4 | 95.2 | 94.0 | 95.8 | 4.2 | 99.8 | 98.2 | 90.8 |
| Barr@16oz(8pre)+Mon@16gm(2pre) | 93.6 | 86.0 | 14.0 | 90.0 | 93.6 | 94.4 | 5.6 | 99.8 | 99.0 | 95.4 |
| Outplay@8oz (2pre) | 90.0 | 96.8 | 3.2 | 95.8 | 96.8 | 96.6 | 3.4 | 95.0 | 89.4 | 71.2 |
| Outplay@8oz (1pre) | 88.6 | 95.2 | 4.8 | 95.2 | 93.2 | 94.6 | 5.4 | 97.2 | 92.4 | 77.8 |
| Outplay@16oz (1pre) | 88.0 | 96.8 | 3.2 | 95.4 | 92.2 | 93.6 | 6.4 | 98.8 | 95.4 | 83.6 |
| Otply@8oz(1pre)+Otply w/NIS@8oz(8post) | 91.6 | 94.2 | 5.8 | 95.6 | 94.0 | 91.6 | 8.4 | 96.8 | 96.0 | 85.0 |
| Otply@8oz w/NIS(8post)+Otply@8oz w/NIS(12post) | 93.2 | 95.8 | 4.2 | 97.0 | 93.4 | 92.8 | 7.2 | 99.6 | 97.6 | 89.6 |
| Otply@16oz w/NIS(8post)+Otply@16oz w/NIS(12post) | 93.2 | 97.6 | 2.4 | 92.6 | 94.8 | 88.0 | 12.0 | 100.0 | 98.6 | 91.4 |
| Pgras@64oz(8post)+Pgras@64oz(12post) | 87.6 | 96.8 | 3.2 | 94.6 | 96.0 | 94.0 | 6.0 | 100.0 | 98.8 | 95.8 |
| Otply@16oz w/NIS+Trimt@8oz(8post)+Trimt@8oz(12post) | 90.6 | 94.8 | 5.2 | 95.8 | 94.4 | 89.6 | 10.4 | 99.6 | 97.4 | 91.4 |
| NTC | 91.2 | 93.6 | 6.4 | 95.2 | 94.6 | 95.4 | 4.6 | 96.6 | 92.2 | 61.0 |
| | | | | | | | | | | |
| Test mean | 90.9 | 94.6 | 5.4 | 94.8 | 94.3 | 93.3 | 6.7 | 98.5 | 95.9 | 84.8 |
| LSD | ns | 4.6 | 4.6 | ns | ns | 4.3 | 4.3 | 2.1 | 4.5 | 12.2 |

Table 6. Syngenta Poa at Green Valley Country Club - fall 2006 to spring 2007.

The University of Arizona, Tucson AZ.

Visual turfgrass QUALITY

Overseeded with ryegrass

| | | | | | | |
|---|------------------|--------|--------|-------|------------------|--------|
| Days after 8 pre | 76 | 84 | 106 | 126 | 154 | 197 |
| Days after 2 pre | 34 | 42 | 64 | 84 | 112 | 155 |
| Days after 1 pre | 27 | 35 | 57 | 77 | 105 | 148 |
| Days after 8 post | - | - | - | 16 | 44 | 87 |
| Days after 12 post | - | - | - | - | 16 | 59 |
| Days after overseed | 17 | 25 | 47 | 67 | 95 | 138 |
| Treatment | ----- 2006 ----- | | | | ----- 2007 ----- | |
| | 18-Oct | 26-Oct | 17-Nov | 7-Dec | 4-Jan | 16-Feb |
| Barricade@16oz (8pre) | 6.4 | 6.4 | 7.6 | 7.8 | 6.6 | 6.4 |
| Barr@16oz(8pre)+Mon@16gm(2pre) | 6.4 | 5.8 | 6.8 | 6.6 | 6.2 | 6.2 |
| Outplay@8oz (2pre) | 7.0 | 7.4 | 7.4 | 7.6 | 6.8 | 6.2 |
| Outplay@8oz (1pre) | 6.4 | 7.2 | 7.4 | 6.6 | 6.2 | 6.0 |
| Outplay@16oz (1pre) | 6.6 | 6.8 | 7.4 | 7.0 | 6.4 | 5.6 |
| Otply@8oz(1pre)+Otply w/NIS@8oz(8post) | 6.8 | 7.2 | 7.2 | 5.8 | 6.6 | 6.4 |
| Otply@8oz w/NIS(8post)+Otply@8oz w/NIS(12post) | 7.6 | 7.2 | 8.0 | 5.4 | 6.8 | 6.4 |
| Otply@16oz w/NIS(8post)+Otply@16oz w/NIS(12post) | 6.8 | 7.2 | 7.0 | 4.4 | 6.4 | 6.0 |
| Pgras@64oz(8post)+Pgras@64oz(12post) | 6.6 | 7.0 | 6.4 | 6.8 | 6.8 | 6.2 |
| Otply@16oz w/NIS+Trimt@8oz(8post)+Trimt@8oz(12post) | 7.4 | 7.4 | 8.0 | 5.2 | 5.2 | 4.2 |
| NTC | 6.0 | 6.4 | 6.6 | 6.8 | 6.4 | 6.0 |
| Test mean | 6.7 | 6.9 | 7.3 | 6.4 | 6.4 | 6.0 |
| LSD | ns | ns | ns | 1.1 | ns | ns |

| Table 7. Syngenta Poa at Green Valley Country Club - fall 2006 to spring 2007. | | | | | | | | | | |
|--|--------------|--------|--------------|------|------------------|--------------|--------|--------|-----|--|
| The University of Arizona, Tucson AZ. | | | | | | | | | | |
| Degree & percent plot injury | | | | | | | | | | |
| <u>Overseeded with ryegrass</u> | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Days after 8 pre | 126 | | | 132 | | | 154 | | 197 | |
| Days after 2 pre | 84 | | | 90 | | | 112 | | 155 | |
| Days after 1 pre | 77 | | | 83 | | | 105 | | 148 | |
| Days after 8 post | 16 | | | 22 | | | 44 | | 87 | |
| Days after 12 post | - | | | - | | | 16 | | 59 | |
| | | | | | | | | | | |
| Days after overseed | 67 | | | 73 | | | 95 | | 138 | |
| ----- 2006 ----- | | | | | ----- 2007 ----- | | | | | |
| 7-Dec | | 13-Dec | | | 4-Jan | | 16-Feb | | | |
| Treatment | injury (poa) | | injury (poa) | | | injury (poa) | | injury | | |
| | degree | % | degree | % | degree | % | degree | % | | |
| Barricade@16oz (8pre) | 1.0 | 0.0 | 1.0 | 0.0 | 1.2 | 2.0 | 1.4 | 7.0 | | |
| Barr@16oz(8pre)+Mon@16gm(2pre) | 1.2 | 1.0 | 1.0 | 0.0 | 1.2 | 5.0 | 1.6 | 9.0 | | |
| Outplay@8oz (2pre) | 1.0 | 0.0 | 1.0 | 0.0 | 1.2 | 2.0 | 1.6 | 7.0 | | |
| Outplay@8oz (1pre) | 1.0 | 0.0 | 1.0 | 0.0 | 1.6 | 4.0 | 1.8 | 10.0 | | |
| Outplay@16oz (1pre) | 1.2 | 2.0 | 1.0 | 0.0 | 1.2 | 3.0 | 1.6 | 7.0 | | |
| Otply@8oz(1pre)+Otply w/NIS@8oz(8post) | 2.0 | 13.0 | 1.4 | 7.0 | 2.0 | 7.0 | 1.4 | 4.0 | | |
| Otply@8oz w/NIS(8post)+Otply@8oz w/NIS(12post) | 2.0 | 16.0 | 2.2 | 18.0 | 2.0 | 19.0 | 1.6 | 8.0 | | |
| Otply@16oz w/NIS(8post)+Otply@16oz w/NIS(12post) | 3.4 | 30.0 | 3.4 | 24.0 | 2.6 | 18.0 | 1.6 | 11.0 | | |
| Pgras@64oz(8post)+Pgras@64oz(12post) | 1.2 | 1.0 | 1.2 | 1.0 | 1.4 | 4.0 | 1.8 | 13.0 | | |
| Otply@16oz w/NIS+Trimt@8oz(8post)+Trimt@8oz(12post) | 2.8 | 30.0 | 2.6 | 29.0 | 3.4 | 23.0 | 4.0 | 33.0 | | |
| NTC | 1.2 | 1.0 | 1.0 | 0.0 | 1.4 | 4.0 | 1.4 | 4.0 | | |
| | | | | | | | | | | |
| Test mean | 1.6 | 8.5 | 1.5 | 7.2 | 1.7 | 8.3 | 1.8 | 10.3 | | |
| LSD | 0.6 | 7.0 | 0.6 | 8.5 | 1.1 | 12.6 | 0.8 | 13.1 | | |

Table 8. Syngenta Poa at Green Valley Country Club - fall 2006 to spring 2007.

The University of Arizona, Tucson AZ.
 Percent plot Poa Annuua & %-Poa control
Overseeded with ryegrass

| | | | | | | |
|---|------------------|-------|-----------|--------|-----------|--------|
| Days after 8 pre | 197 | 224 | 235 | | | |
| Days after 2 pre | 155 | 182 | 193 | | | |
| Days after 1 pre | 148 | 175 | 186 | | | |
| Days after 8 post | 87 | 114 | 125 | | | |
| Days after 12 post | 59 | 86 | 97 | | | |
| Days after overseed | 138 | 165 | 176 | | | |
| | ----- 2007 ----- | | | | | |
| | 16-Feb | | 15-Mar | | 26-Mar | |
| Treatment | %-Control | | %-Control | | %-Control | |
| Barricade@16oz (8pre) | 94.1 | (0.2) | 76.9 | (1.8) | 76.4 | (9.2) |
| Barr@16oz(8pre)+Mon@16gm(2pre) | 94.1 | (0.2) | 87.2 | (1.0) | 88.2 | (4.6) |
| Outplay@8oz (2pre) | -47.1 | (5.0) | -35.9 | (10.6) | 26.2 | (28.8) |
| Outplay@8oz (1pre) | 17.6 | (2.8) | 2.6 | (7.6) | 43.1 | (22.2) |
| Outplay@16oz (1pre) | 64.7 | (1.2) | 41.0 | (4.6) | 57.9 | (16.4) |
| Otply@8oz(1pre)+Otply w/NIS@8oz(8post) | 5.9 | (3.2) | 48.7 | (4.0) | 61.5 | (15.0) |
| Otply@8oz w/NIS(8post)+Otply@8oz w/NIS(12post) | 88.2 | (0.4) | 69.2 | (2.4) | 73.3 | (10.4) |
| Otply@16oz w/NIS(8post)+Otply@16oz w/NIS(12post) | 100.0 | (0.0) | 82.1 | (1.4) | 77.9 | (8.6) |
| Pgras@64oz(8post)+Pgras@64oz(12post) | 100.0 | (0.0) | 84.6 | (1.2) | 89.2 | (4.2) |
| Otply@16oz w/NIS+Trimt@8oz(8post)+Trimt@8oz(12post) | 88.2 | (0.4) | 66.7 | (2.6) | 77.9 | (8.6) |
| NTC | - | (3.4) | - | (7.8) | - | (39.0) |
| Test mean | 60.6 | 1.5 | 52.3 | 4.1 | 67.2 | 15.2 |
| LSD | 55.2 | 2.1 | 58.1 | 4.5 | 31.1 | 12.2 |

Note: negative percent control indicates greater amounts of Poa were present than on the UTC.

** Value in parenthesis is of the actual percent plot Poa present.

Table 9. Syngenta Poa at Green Valley Country Club - fall 2006 to spring 2007.
 The University of Arizona, Tucson AZ.
 Canopy DENSITY
Overseeded with ryegrass

| | | | | | | | | |
|---|------------------|--------|--------|-------|--------|-------|------------------|--------|
| Days after 8 pre | 68 | 76 | 84 | 91 | 106 | 126 | 154 | 197 |
| Days after 2 pre | 26 | 34 | 42 | 49 | 64 | 84 | 112 | 155 |
| Days after 1 pre | 19 | 27 | 35 | 42 | 57 | 77 | 105 | 148 |
| Days after 8 post | - | - | - | - | - | 16 | 44 | 87 |
| Days after 12 post | - | - | - | - | - | - | 16 | 59 |
| Days after overseed | 9 | 17 | 25 | 32 | 47 | 67 | 95 | 138 |
| Treatment | ----- 2006 ----- | | | | | | ----- 2007 ----- | |
| | 10-Oct | 18-Oct | 26-Oct | 2-Nov | 17-Nov | 7-Dec | 4-Jan | 16-Feb |
| Barricade@16oz (8pre) | 3.0 | 7.0 | 6.6 | 6.2 | 6.8 | 8.0 | 7.2 | 7.0 |
| Barr@16oz(8pre)+Mon@16gm(2pre) | 2.6 | 6.6 | 5.8 | 5.4 | 6.6 | 7.4 | 7.0 | 6.4 |
| Outplay@8oz (2pre) | 2.6 | 7.8 | 8.0 | 7.4 | 6.6 | 8.4 | 7.8 | 6.6 |
| Outplay@8oz (1pre) | 2.8 | 7.2 | 7.8 | 6.8 | 6.8 | 7.4 | 7.4 | 6.4 |
| Outplay@16oz (1pre) | 3.0 | 6.6 | 7.4 | 7.4 | 7.2 | 7.6 | 7.2 | 6.0 |
| Otply@8oz(1pre)+Otply w/NIS@8oz(8post) | 3.6 | 7.8 | 7.2 | 7.0 | 7.2 | 6.8 | 7.0 | 6.6 |
| Otply@8oz w/NIS(8post)+Otply@8oz w/NIS(12post) | 4.4 | 7.4 | 8.2 | 7.6 | 8.0 | 7.6 | 7.4 | 6.8 |
| Otply@16oz w/NIS(8post)+Otply@16oz w/NIS(12post) | 3.8 | 7.2 | 8.2 | 7.4 | 6.6 | 6.0 | 7.2 | 6.2 |
| Pgras@64oz(8post)+Pgras@64oz(12post) | 3.4 | 6.8 | 7.4 | 6.6 | 7.0 | 7.2 | 7.0 | 6.4 |
| Otply@16oz w/NIS+Trimt@8oz(8post)+Trimt@8oz(12post) | 3.8 | 7.4 | 7.6 | 7.2 | 8.2 | 6.8 | 5.6 | 5.2 |
| NTC | 3.4 | 6.2 | 7.0 | 6.2 | 7.4 | 7.4 | 7.4 | 6.0 |
| Test mean | 3.3 | 7.1 | 7.4 | 6.8 | 7.1 | 7.3 | 7.1 | 6.3 |
| LSD | ns | ns | 1.4 | 1.4 | ns | 1.2 | ns | ns |