Multiple Applications of Proxy (ethephon) for Seed Head Suppression on an Annual Bluegrass (*Poa annua*) Putting Green

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Introduction

A field research trial conducted on an annual bluegrass putting green at the Spanish Bay Golf Links located in Pebble Beach, California during 1999 showed a 96% reduction in *Poa annua* seed heads when compared to untreated check plots 14 days after a single treatment of Proxy (ethephon) applied at a rate of 5.0 ounces of product per thousand square feet (oz/M). Seed head suppression in Proxy treated plots remained at 96% 28 days after treatment (DAT). By 39 DAT the level of annual bluegrass seed head suppression had fallen to 30%. Embark (4.0 oz/A) exhibited 42% seed head suppression and Primo 1 EC (0.12 oz/M) exhibited 12% seed head suppression 28 DAT.

No injury or reduction in surface quality was observed following a single Proxy application at the 5.0 or 10.0 ounce rate. Surface appearance improved based on the virtual elimination of annual bluegrass seed heads.

The objectives of this new Proxy field study were as follows:

1. to determine the effect of three Proxy treatments applied at six week intervals for seed head suppression on an annual bluegrass putting green, and

2. to evaluate the potential for Proxy to injure an annual bluegrass putting green when subject to this multiple application program.

Materials & Methods

The field study was conducted on the chipping green at the Links at Spanish Bay Golf Club located in Pebble Beach, California. This area is characterized as a true coastal Mediterranean climate with cool, foggy summer conditions. High daytime temperatures generally range from 60 to 70° F with nighttime low temperatures of 48 to 55° F.

This USGA sand specification chipping green consisted of 100% annual bluegrass and was mowed seven days per week at a cutting height of 140/1000". The green received regular foliar fertilizer treatments, was aerified with 1" hollow tines once during the 18 week trial and was irrigated to avoid moisture stress. An initial rating on the day of the first application, March 21, 2000, showed a mean average of 37.5% Poa seed head cover across four replications.

Treatments as presented in Table 1 were deployed on March 6, April 20 and May 29, 2000. The soil temperature registered 51.8° F at a depth of three inches and the air temperature was 57.2° F at 9:29 a.m. during the first treatment deployment. Individual treatment plots
measured 5’ x 10’ with 24” aisleways. Treatments were replicated four times in a randomized complete block design. A calibrated CO2 propelled spray system pressurized to 26 psi and equipped with 11004LP Tee-Jet nozzles applied treatments at a spray volume of 65 gallons per acre. A pacing watch was used to ensure appropriate walking speed and accurate applications.

Treatment evaluations consisting of percent annual bluegrass seed head cover and annual bluegrass injury were conducted at approximate rating dates of 7, 14, 28 and 42 days after every treatment. Annual bluegrass injury was rated on a 0 to 10 scale with 0 representing no injury, 3 minimally acceptable injury and 10 dead grass. Percent seed head control was calculated based on a comparison between the untreated check and changes in percent seed head cover. A simple green speed evaluation using the stimpmeter was conducted during six rating dates. Data were summarized and statistically analyzed. Differences between means were determined via LSD.

**Results & Discussion**

**Annual Blue-grass Injury**

- No treatment exhibited observable injury to annual bluegrass during any of the 14 rating events throughout the course of the 18 week trial. A visual review of soil cores following the trial showed no observable difference in root depth or density among treatments.

**Proxy Performance Following the First of Three Applications (Table 1)**

- Proxy at the 5.0 and 10.0 ounce rates showed limited seed head suppression, 4% and 11% control, respectively, 7 days after the first application. However, by 15 DAT seed head control had increased dynamically to 70% for the 5.0 ounce rate and 85% control for the 10.0 ounce rate.

- The 10.0 ounce Proxy rate showed better seed head suppression than the 5.0 ounce rate on six of six ratings dates following the first application. During three of six rating events, 15, 28 and 44 DAT, the differences were statistically significant. Over the course of six rating dates encompassing 44 days after the first application, the 10.0 ounce Proxy rate showed an average improvement in control of 13.3% per rating event when compared to the 5.0 ounce rate. Control fell off dramatically for both rates between 28 and 35 DAT.

- The 10.0 ounce Proxy rate was consistently more visually dynamic than the 5.0 ounce rate relative to annual bluegrass seed head suppression.
Table 1. Percent Seed Head Cover and Control on an Annual Bluegrass Putting Green Following the First of Three Proxy Treatments Applied at Six Week Intervals. The Links at Spanish Bay, Pebble Beach, CA. Mahady & Associates, Inc. 2000.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Rate</th>
<th>Application Schedule</th>
<th>Cover (Control) 3/13/00</th>
<th>Cover (Control) 3/21/00</th>
<th>Cover (Control) 3/28/00</th>
<th>Cover (Control) 4/4/00</th>
<th>Cover (Control) 4/11/00</th>
<th>Cover (Control) 4/20/00</th>
</tr>
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<tbody>
<tr>
<td>1 Check</td>
<td>33.8 a</td>
<td>0%</td>
<td>42.0 a</td>
<td>59.5 a</td>
<td>58.8 a</td>
<td>72.5 a</td>
<td>47.5 a</td>
<td>0%</td>
</tr>
<tr>
<td>2 Proxy 5.0 oz/M</td>
<td>32.5 a</td>
<td>(4%)</td>
<td>12.8 b</td>
<td>6.3 b</td>
<td>11.3 b</td>
<td>35.0 b</td>
<td>21.3 b</td>
<td>(0%)</td>
</tr>
<tr>
<td>3 Proxy 10.0 oz/M</td>
<td>30.0 a</td>
<td>(11 %)</td>
<td>6.5 c</td>
<td>2.3 b</td>
<td>3.3 c</td>
<td>16.0 c</td>
<td>15.5 b</td>
<td>(0%)</td>
</tr>
</tbody>
</table>

Means followed by the same letter do not differ significantly (P=0.05, Duncan's MRT)

Proxy Performance Following the Second of Three Applications (Table 2)

- Following the second Proxy treatment, response as interpreted as a rapid reduction in the presence of annual bluegrass seed heads, was much more rapid than that observed following the first application. Seven days after the second Proxy treatment, seed head control had increased dynamically to 88% for the 5.0 ounce rate and 93% control for the 10.0 ounce rate. There was no 15 day lag time for an acceptable level of control as was observed following the first application.

- The 10.0 ounce Proxy rate showed better seed head suppression than the 5.0 ounce rate on five of five ratings dates following the second application. However, on only one of five rating events, the 39 DAT rating, was the difference statistically significant.

- Over the course of five rating dates encompassing 39 days after the second application, the 10.0 ounce Proxy rate showed an average improvement in seed head control of 9.5% per rating event when compared to the 5.0 ounce rate.

- Percent seed head control fell off dramatically for both rates between 28 and 39 DAT.

- The 10.0 ounce Proxy rate was consistently more visually dynamic than the 5.0 ounce rate relative to annual bluegrass seed head suppression.
Table 2. Percent Seed Head Cover and Control on an Annual Bluegrass Putting Green Following the Second of Three Proxy Treatments Applied at Six Week Intervals. The Links at Spanish Bay, Pebble Beach, CA. Mahady & Associates, Inc. 2000.

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<th>Cover (Control)</th>
<th>Cover (Control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Check</td>
<td></td>
<td></td>
<td>47.5 a (0%)</td>
<td>55.3 a (0%)</td>
<td>56.3 a (0%)</td>
<td>63.8 a (0%)</td>
<td>61.3 a (0%)</td>
</tr>
<tr>
<td>2 Proxy  5.0 oz/M</td>
<td>4/20/00</td>
<td>21.3 b (55%)</td>
<td>6.8 b (88%)</td>
<td>4.3 b (92%)</td>
<td>9.0 b (86%)</td>
<td>25.0 b (59%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(#2 of 3)</td>
<td>(67%)</td>
<td>(93%)</td>
<td>(98%)</td>
<td>(96%)</td>
<td>(76%)</td>
</tr>
<tr>
<td>3 Proxy 10.0 oz/M</td>
<td>4/20/00</td>
<td>15.5 b (67%)</td>
<td>4.0 b (93%)</td>
<td>1.0 b (98%)</td>
<td>2.8 c (96%)</td>
<td>15.0 c (76%)</td>
<td></td>
</tr>
</tbody>
</table>

Proxy Performance Following the Third of Three Applications (Table 3)

- Seven days after the third Proxy treatment, visual estimations showed 75% seed head control at the 5.0 ounce rate and 82% for the 10.0 ounce rate.

- The 10.0 ounce Proxy rate showed better seed head suppression than the 5.0 ounce rate on five of five ratings dates following the third application. However, on only one of five rating events, the 14 DAT rating, was the difference statistically significant.

- Over the course of five rating dates encompassing 42 days after the second application, the 10.0 ounce Proxy rate showed an average improvement in seed head control of 4.6% per rating event when compared to the 5.0 ounce rate.

- Percent seed head control fell off dramatically for both rates between 28 and 42 DAT.

- The 10.0 ounce Proxy rate was consistently more visually dynamic than the 5.0 ounce rate relative to annual bluegrass seed head suppression.

Table 3. Percent Seed Head Cover and Control on an Annual Bluegrass Putting Green Following the Third of Three Proxy Treatments Applied at Six Week Intervals. The Links at Spanish Bay, Pebble Beach, CA. Mahady & Associates, Inc. 2000.

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<th>Cover (Control)</th>
<th>Cover (Control)</th>
<th>Cover (Control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Check</td>
<td></td>
<td></td>
<td>61.3 a (0%)</td>
<td>73.8 a (0%)</td>
<td>72.5 a (0%)</td>
<td>56.3 a (0%)</td>
<td>57.5 a (0%)</td>
</tr>
<tr>
<td>2 Proxy  5.0 oz/M</td>
<td>5/29/00</td>
<td>25.0 b (59%)</td>
<td>18.8 b (75%)</td>
<td>12.8 b (82%)</td>
<td>13.5 b (76%)</td>
<td>36.8 b (36%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(#3 of 3)</td>
<td>(76%)</td>
<td>(82%)</td>
<td>(91%)</td>
<td>(81%)</td>
<td>(41%)</td>
</tr>
<tr>
<td>3 Proxy 10.0 oz/M</td>
<td>5/29/00</td>
<td>15.0 c (76%)</td>
<td>13.3 b (82%)</td>
<td>6.3 c (91%)</td>
<td>10.5 b (81%)</td>
<td>33.8 b (41%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(#3 of 3)</td>
<td>(76%)</td>
<td>(82%)</td>
<td>(91%)</td>
<td>(81%)</td>
<td>(41%)</td>
</tr>
</tbody>
</table>
Summary & Practical Perspectives

Three sequential treatments of Proxy applied to an annual bluegrass putting green at a rate of 5.0 ounces of product per thousand square feet at six week intervals resulted in a mean average of 72.3% seed head control during 13 rating events evaluated over an 18 week period. The 10.0 ounce Proxy rate showed a mean average of 82.9% seed head control over the same period. The 10.0 ounce Proxy rate was consistently more visually dynamic than the 5.0 ounce rate relative to annual bluegrass seed head suppression.

With the exception of the 7 DAT rating following the first application, Proxy consistently showed the most effective seed head suppression between 7 and 28 DAT with a dramatic reduction in efficacy between 28 and 42 DAT.

No treatment exhibited observable injury to annual bluegrass during any rating event throughout the course of the eighteen-week trial. A simple visual review of soil cores in every treatment following the trial showed no observable difference in root depth or density among treatments.

Green speed evaluations were conducted with a stimpmeter on six rating dates during the 18 week trial. No significant differences or trends among or between treatments were observed.

From these data generated on an annual bluegrass green in the moderate coastal climate of the Monterey Peninsula, it would appear that at these rates and application intervals Proxy is a very safe and effective new tool for the control of seed heads on annual bluegrass putting greens.

If a putting green label is to be pursued, it is highly recommended that a multiple application rate/injury trial reviewing higher 2x and 3x rates be conducted. A rate structure of 5, 10, 15, 20 and 25 ounces per thousand square feet is recommended. Such work would help establish a 2x and 3x safety margin for overlapped applications, which would provide critical information specific to the development of a Proxy surface management program for annual bluegrass putting greens.

Acknowledgements

A special thanks to Superintendent, Tom Huesgen and the maintenance staff at The Links at Spanish Bay for their conscientious efforts in maintaining the research site throughout the course of the trial.