

## **Efficacy and Safety of Proxy-rate Programs in Winter for Annual Bluegrass Seedhead Management**

Adam Van Dyke, M.S., CPAg, Professional Turfgrass Solutions LLC

Author email: adam@proturfgrassolutions.com

### **Objectives**

1. Confirm the efficacy of Proxy applications in winter compared to standard spring applications for seedhead management.
2. Determine if Proxy application rate in winter influences seedhead suppression.

### **Materials and Methods**

This RMEGI supported research was conducted from November 2017 until May 2018 on a 70:30 annual bluegrass: creeping bentgrass putting green at Murphy Creek Golf Course in Aurora, Colorado. Proxy® (Bayer) was applied at two winter timings, and at different rates, to evaluate the effectiveness of making early applications compared to just making traditional spring applications for controlling seedheads of annual bluegrass. Proxy was applied at a pre-snow timing (before snow cover) on November 20, 2017 and at a post-snow timing (after snow melt) on March 8, 2018. Winter Proxy treatments included different application rates at each timing (pre-snow rate followed by (fb) post-snow rate) including: 2.5 fl. oz. fb 5 fl. oz./1000ft<sup>2</sup>; 5 fl. oz. fb 5 fl. oz./1000ft<sup>2</sup>; 7.5 fl. oz. fb 5 fl. oz./1000ft<sup>2</sup>; 10 fl. oz. fb 5 fl. oz./1000ft<sup>2</sup>; 5 fl. oz. fb 7.5 fl. oz./1000ft<sup>2</sup>; and 5 fl. oz. fb 10 fl. oz./1000ft<sup>2</sup>. Winter Proxy treatments also received the standard spring seedhead applications used at the golf course and were compared to a spring program check treatment. An untreated control was also included. All treatments are listed in Table 1. Treatments were applied to 4-foot by 6-foot completely randomized plots replicated four times. Winter Proxy treatments were applied with a backpack sprayer in 2 gallons of water/1000 ft<sup>2</sup> at 40 psi through TeeJet AI11002VS nozzles. Spring program applications were made by the golf course superintendent with a Toro 5500 sprayer in 1.5 gallons/1000 ft<sup>2</sup> operating at 30 psi. Two spring applications of Proxy at 5 fl. oz./1000ft<sup>2</sup> mixed with Primo Maxx® (Syngenta) at 0.125 fl. oz./1000 ft<sup>2</sup> were made on March 30 and April 25, 2018. Untreated plots were covered when spring applications were made. A fungicide was uniformly applied before snow cover to protect turf against snow molds, and no aerification occurred during the study. Turf was mowed at 0.125 inches daily and irrigated to prevent stress during the growing season.

Annual bluegrass seedheads peaked in mid-May and were rated a 0%-100% cover scale, where 100= complete seedhead cover in the plot. Abbott's corrected calculation was used to determine seedhead suppression (or control) relative to untreated turf. Turf quality was rated at each application, and when seedheads peaked, on a 1-9 visual scale, where 6 is the lowest acceptable rating. Turf color was also measured the same days using a CM-1000 chlorophyll meter. Three index measurements (0-999 scale) were taken in each plot and averaged for the plot mean, where higher numbers equal darker green turf. Data was analyzed for differences using ARM 2018.3 (Gylling Data Management) with means compared using Fishers' protected LSD at a 95% confidence interval. Data that was skewed or not homogeneous were normalized with an appropriate transformation.

## Seedhead Suppression Results

The treatments had a significant effect on seedhead control (Table 2). Specific effects include:

- Seedheads covered 65% of untreated turf on May 17, 2018.
- The spring program of Proxy+Primo, applied in March and again in April, provided only 11% control of seedheads. Efficacy was significantly improved when spring applications were preceded by winter applications of Proxy (Figure 1).
  - Proxy applied at 5 fl.oz. at both the pre-snow and post-snow winter timings (then followed by the spring program) controlled 69% seedheads. This approach has consistently improved seedhead suppression in other research funded by the RMEGI (80%-91% control in 2017 in Colorado; >90% control in 2015 in Utah).
    - Decreasing the rate of Proxy to 2.5 fl.oz. at the pre-snow timing, then following with a 5 fl.oz. rate at post-snow timing, was less efficacious. The 2.5 fb 5 treatment provided 38% control of seedheads.
    - Increasing the rate of Proxy to 7.5 fl.oz. at either winter timing, with 5 fl.oz. applied at the other timing, did not influence efficacy compared to the 5 fb 5 treatment. The 7.5 fb 5 treatment provided 67% control and the 5 fb 7.5 treatment provided 60% control.
    - Increasing the rate of Proxy to 10 fl.oz. at the pre-snow timing, was more efficacious, but increasing Proxy to 10 fl.oz at the post-snow did not improve efficacy over the 5 fb 5 treatment. The 10 fb 5 treatment provided 87% control of seedheads and the 5 fb 10 treatment provided 60% control.
  - This data supports including winter applications of Proxy before traditional spring applications to improve seedhead suppression. Some off-label rates of Proxy (10 fl.oz.) in winter appear to be more effective and should be studied further. Consult your Proxy representative before using off-label rates, and always follow label directions.

## Turf Quality and Color Results

The treatments had a significant effect on turf quality in spring, but not on turf color (Table 2). Specific effects include:

- Winter applications of Proxy were safe to the putting green turf. No phytotoxicity was observed as turf entered or broke dormancy (data not shown), supported by no visual (quality) or measured (color) differences in March (Figure 2).
- Untreated turf had the worst quality in spring as seedheads peaked. The spring program of Proxy+Primo did not improve quality because seedheads were not effectively controlled. Turf quality was improved by including winter Proxy applications before the spring program (Figure 3).
  - The 10 fb 5 Proxy treatment provided the best quality. The next best quality came from the 7.5 fb 5, 5 fb 5, and 5 fb 10 Proxy treatments, then the 5 fb 7.5 and 2.5 fb 5 Proxy treatments.
  - None of the winter Proxy treatments improved turf color over the spring program treatment or untreated turf in May.

## Summary

A standard spring program of Proxy+Primo provided 11% control seedheads in 2018. Preceding the spring program with winter applications of Proxy (before snow cover and after snow melted) improved control. The rate of Proxy applied before snow cover had a significant effect, with 10 fl.oz being more efficacious and 2.5 fl.oz less efficacious than the labeled 5 fl.oz-rate. Different Proxy rates applied after snow melted were not as significant, with differences between the two winter timings likely related to environmental factors and should be studied further. Winter Proxy applications were safe to the putting green turf and did not influence quality or color as turf entered or broke winter dormancy. However, when seedheads developed in May turf quality was improved from Proxy applications in winter.

## Acknowledgements

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**Table 1.** Winter Proxy-rate treatments evaluated for annual bluegrass seedhead suppression compared to standard spring program applications at Murphy Creek Golf Course, Aurora, CO, 2017-18.

| Treatment         | Description                                                                                     | Product/Rate (fl.oz/1000)                                          | Application Date                                                |
|-------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------|
| Untreated         | Untreated                                                                                       | None                                                               | None                                                            |
| Proxy<br>5 fb 5   | Pre-snow Proxy<br>Post-snow Proxy<br>+Spring 1 <sup>st</sup> app<br>+Spring 2 <sup>nd</sup> app | Proxy/5<br>Proxy/5<br>Proxy/5+Primo/0.125<br>Proxy/5+Primo/0.125   | Nov. 20, 2017<br>Mar. 8, 2018<br>Mar. 30, 2018<br>Apr. 25, 2018 |
| Proxy<br>2.5 fb 5 | Pre-snow Proxy<br>Post-snow Proxy<br>+Spring 1 <sup>st</sup> app<br>+Spring 2 <sup>nd</sup> app | Proxy/2.5<br>Proxy/5<br>Proxy/5+Primo/0.125<br>Proxy/5+Primo/0.125 | Nov. 20, 2017<br>Mar. 8, 2018<br>Mar. 30, 2018<br>Apr. 25, 2018 |
| Proxy<br>7.5 fb 5 | Pre-snow Proxy<br>Post-snow Proxy<br>+Spring 1 <sup>st</sup> app<br>+Spring 2 <sup>nd</sup> app | Proxy/7.5<br>Proxy/5<br>Proxy/5+Primo/0.125<br>Proxy/5+Primo/0.125 | Nov. 20, 2017<br>Mar. 8, 2018<br>Mar. 30, 2018<br>Apr. 25, 2018 |
| Proxy<br>10 fb 5  | Pre-snow Proxy<br>Post-snow Proxy<br>+Spring 1 <sup>st</sup> app<br>+Spring 2 <sup>nd</sup> app | Proxy/10<br>Proxy/5<br>Proxy/5+Primo/0.125<br>Proxy/5+Primo/0.125  | Nov. 20, 2017<br>Mar. 8, 2018<br>Mar. 30, 2018<br>Apr. 25, 2018 |
| Proxy<br>5 fb 7.5 | Pre-snow Proxy<br>Post-snow Proxy<br>+Spring 1 <sup>st</sup> app<br>+Spring 2 <sup>nd</sup> app | Proxy/5<br>Proxy/7.5<br>Proxy/5+Primo/0.125<br>Proxy/5+Primo/0.125 | Nov. 20, 2017<br>Mar. 8, 2018<br>Mar. 30, 2018<br>Apr. 25, 2018 |
| Proxy<br>5 fb 10  | Pre-snow Proxy<br>Post-snow Proxy<br>+Spring 1 <sup>st</sup> app<br>+Spring 2 <sup>nd</sup> app | Proxy/5<br>Proxy/10<br>Proxy/5+Primo/0.125<br>Proxy/5+Primo/0.125  | Nov. 20, 2017<br>Mar. 8, 2018<br>Mar. 30, 2018<br>Apr. 25, 2018 |
| Spring program    | +Spring 1 <sup>st</sup> app<br>+Spring 2 <sup>nd</sup> app                                      | Proxy/5+Primo/0.125<br>Proxy/5+Primo/0.125                         | Mar. 30, 2018<br>Apr. 25, 2018                                  |

**Table 2.** Effect of Proxy-rate programs applied in winter on annual bluegrass seedhead control and putting green color and quality. Murphy Creek Golf Course, Aurora, CO, 2017-18.

| Treatment/Rate (fl.oz/1000)<br><i>Pre-snow fb Post-snow<sup>v</sup></i> | Seedhead <sup>w</sup> |                 | Color <sup>x</sup> |                 |                | Quality <sup>y</sup> |                |
|-------------------------------------------------------------------------|-----------------------|-----------------|--------------------|-----------------|----------------|----------------------|----------------|
|                                                                         | Control<br>May 17     | Cover<br>May 17 | 2017<br>Nov. 20    | 2018<br>March 7 | 2018<br>May 17 | 2018<br>March 7      | 2018<br>May 17 |
|                                                                         | (%)                   | (%)             |                    | (index)         |                | (#)                  | (#)            |
| Proxy/10 fb 5 + Spring program <sup>u</sup>                             | 86.8 a <sup>z</sup>   | 8.5 d           | 140 a              | 86 a            | 228 a          | 5.0 a                | 8.3 a          |
| Proxy/5 fb 5 + Spring program                                           | 69.0 b                | 20.0 c          | 149 a              | 87 a            | 251 a          | 5.0 a                | 7.0 bc         |
| Proxy/7.5 fb 5 + Spring program                                         | 66.7 b                | 21.3 c          | 147 a              | 88 a            | 242 a          | 5.0 a                | 7.3 b          |
| Proxy/5 fb 10 + Spring program                                          | 60.1 b                | 26.3 c          | 142 a              | 85 a            | 236 a          | 5.0 a                | 6.5 bcd        |
| Proxy/5 fb 7.5 + Spring program                                         | 59.8 b                | 26.3 c          | 147 a              | 86 a            | 237 a          | 5.0 a                | 6.3 cd         |
| Proxy 2.5 fb 5 + Spring program                                         | 38.1 c                | 40.0 c          | 145 a              | 86 a            | 243 a          | 5.0 a                | 6.0 d          |
| Spring program only                                                     | 11.3 d                | 57.5 a          | 144 a              | 86 a            | 243 a          | 5.0 a                | 5.0 e          |
| Untreated/0                                                             | ---                   | 65.0 a          | 145 a              | 86 a            | 234 a          | 5.0 a                | 4.8 e          |
| <b>ANOVA</b>                                                            | <b>df</b>             |                 |                    |                 |                |                      |                |
| Treatment                                                               | 7                     | ***             | ***                | ns              | ns             | ns                   | ***            |

<sup>u</sup>Spring program applications included Proxy (5 fl.oz)+Primo Maxx (0.125 fl.oz) on March 30 and April 25, 2018.

<sup>v</sup>Pre-snow application on Nov. 20, 2017; Post-snow application on Mar. 8, 2018.

<sup>w</sup>Seedhead cover rating scale: 0%-100% of plot; Control determined by Abbott's corrected calculations relative to untreated turf.

<sup>x</sup>Turf color measured with a CM-1000 chlorophyll meter on an index scale, where higher numbers equal darker green turf.

<sup>y</sup>Turf quality rating scale: 1-9, where 6= lowest acceptable.

<sup>z</sup>Means within same column with the same letter are not different significantly ( $P=0.05$ ).

\*, \*\*, \*\*\*, ns, significant at  $P \leq 0.05$ , 0.01, 0.001, or not significant respectively.



**Figure 1.** Winter applications of Proxy that preceded standard spring Proxy+Primo applications significantly improved seedhead control. Rate of Proxy applied before snow cover had a significant effect, with a 2.5oz-rate being less efficacious and an off-label 10oz-rate being more efficacious than the standard 5oz-rate. Rate of Proxy applied after snow was not significant in this experiment.



**Figure 2.** Winter applications of Proxy were safe to the putting green turf. No visible discoloration, crown rising, or other injury that would negatively impact turf health was observed as turf entered or broke dormancy. Photo taken March 8, 2018.



**Figure 3.** Winter applications of Proxy did not impact turf color in spring but did improve turf quality over the spring program due to differences in seedhead control. Photo taken May 17, 2018.