Enhancing Survival and Appearance of *Poa annua* with Growth Regulators

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*Poa annua* is a winter annual grassy weed that germinates in the fall, overwinters as a vegetative plant, continues growth in the early spring, develops a seedhead in late May (in Michigan), and senesces vegetatively at the onset of heat and drought in the summer. The grass survives the summer as seed, some of which germinates the following fall and the life cycle begins again.

In Michigan the widespread use of fully automatic irrigation has led to the summer survival of the vegetative *Poa annua* plant. For the most part, relieving the drought problems has allowed *Poa annua* to survive the heat of Michigan summers primarily due to the cool nights that exist in most of the state.

However, *Poa annua* still exhibits unsightly seedheads every May, with an associated loss of turf color and quality. The plant has been observed to become stemmy, to lose or senesce the lower leaves and to exhibit an overall yellowing in spite of careful and judicious irrigation practices. This response appears to be the first of a series of problems associated with growing *Poa annua* in the summer.

Following this loss of turf quality due to what is apparently programmed in the *Poa annua* biological clock, the grass has problems with summer diseases and wilt. In areas where the relative humidity remains high for long periods of time during the summer, diseases such as Pythium and brown patch can be severe problems. In areas where the relative humidity is very low, a combination of high temperature and wind can result in an evaporative driving force that is greater than can be supplied by the vascular or root system. *Poa annua* is highly susceptible to wilt under these conditions, even when soil moisture is adequate. Syringing plays an important role managing *Poa annua* under these conditions.

Michigan rarely has prolonged high humidity conditions in the summer that are so severe that fungicides cannot be used to effectively control Pythium and brown patch. On the other side, careful syringing has been used to control most problems of *Poa annua* in Michigan which has resulted in the development of other problems, most noticeably that of Anthracnose.

The use of vegetative growth retardants on fine turfgrass areas has been limited because of loss of recuperative potential of the grass. Thus, areas under high wear cannot be culturally released from the effects of these chemicals.

The objectives of this investigation were to evaluate the effectiveness of the chemical growth regulators Mefluidide (EMBARK) and the soil active analog MBR-18337 in reducing seedhead development and natural senescence of *Poa annua*. Secondly, to determine the proper application rate and timing for maximum effectiveness of the compounds.

## Materials and Methods

Treatments were applied to mature *Poa annua* fairways on October 22, November 7 and November 25, 1980 on Walnut Hills Golf Course. On May 4, 1981, treatments were applied at the Country Club of Lansing. In each treatment, plots were sprayed with a bicycle sprayer fixed with a $CO_2$ tank that delivered 27 gpa at 25 psi. Plot size was 1 X 2 meters with a 0.5 meter border between plots along the 1 meter direction. Hence, the overall plot size was 1.5 X 2 meters.

The treatments applied in the fall included the following:

| | CHEMICAL | FORMULATION | RATE |
|---|---|---|---|
| 1) | Embark | 2S | 280 g/ha (1/4 lb/A) |
| 2) | MBR-18337 | 0.18G | 280 g/ha (1/4 lb/A) |
| 3) | MBR-18337 | 2EC | 280 g/ha (1/4 lb/A) |
| 4) | Embark | 2S | 140 g/ha (1/8 lb/A) |
| 5) | MBR-18337 | 0.09G | 140 g/ha (1/8 lb/A) |
| 6) | MBR-18337 | 2EC | 140 g/ha (1/8 lb/A) |
| 7) | CONTROL | | |

The treatments applied in the spring included:

| | CHEMICAL | FORMULATION | RATE |
|---|---|---|---|
| 1) | Embark | 2S | 70 g/ha (1/16 lb/A) |
| 2) | MBR-18337 | 2EC | 70 g/ha (1/16 lb/A) |
| 3) | Embark | 2S | 140 g/ha (1/8 lb/A) |
| 4) | MBR-18337 | 2EC | 140 g/ha (1/8 lb/A) |
| 5) | CONTROL | | |

## Fall Study Results

When the chemicals were applied on October 22, a great deal of apparent freezing injury was found during winter and early spring (Tables 1, 2 and 3). The February rating showed all treatments except the low granular application of MBR-18337 significantly phytotoxic compared to the control. By the April 14 rating the control plot improved in quality while none of the treated plots changed. On May 2, the treated plots began to green up, however, all were significantly poorer than the control. By May 25, both granular formulations and the low rate of the EC formulation of MBR-18337 were not significantly different from the control (Table 4). The foliarly active Embark was the most toxic at all evaluation dates.

When the chemicals were applied on November 7, much less injury was observed (Tables 1, 2 and 3). This treatment date did not result in as much injury at the mid-winter thaw in February as the October treatment. Greatest injury was noted on April 14, but by May 2 the granular treatments were no different from the check. On May 25 the high rate of Embark was the only treatment showing toxicity (Table 4).

When the chemicals were applied on November 22, no significant toxic effects were found in February (Table 1). Some differences were seen on April 14, where it was noted that the greatest toxicity was found with the EC formulation of MBR-18337 (Table 2). Embark exhibited essentially no toxic effects at this application date. By May 2 and thereafter no toxicity was noted Tables 3 and 4).

On May 25, the plots were also evaluated for seedhead inhibition (Table 4). The seedheads were nearly eliminated in all treatments. The data show that all Embark and MBR-18337 treatments eliminated seedhead development of *Poa annua* by the October treatment.

The seedhead data is the same for the November treatment as for October. Note that Embark is not quite as effective as MBR-18337.

In the case of the late November treatments, MBR-18337 was the most effective in eliminating seedheads.

## Spring Study Results

In the spring study, some phytotoxic responses were found from 13 to 21 days after application (Table 5). Note that the poorest quality rating was only 7.8 which is not severe. Yet compared to the control, this response is significant. As the seedheads developed from May 13 through May 21 in the control plot, all chemicals were effective in preventing seedhead development on *Poa annua* (Table 5). From May 31 to June 25 the control plot declined in dark green color due to the natural senescence associated with seedhead development (Table 5). In most cases the plots treated with Embark and MBR-18337 prevented the normal color loss and sometimes increased the dark green color.

## Summary

1. Fall and spring applied Embark and MBR-18337 will prevent seedhead development on *Poa annua* the following May.

2. Late fall applications minimize the chance of winter injury.

3. The granular formulation of MBR-18337 was less toxic and equally efficacious compared to the liquid formulations.

4. The dark green response was associated with the prevention of natural senescence and not with vegetative growth control.

*Table 1. February phytotoxicity ratings of fall applied treatments of Embark and MBR-18337.

| Treatment | Treatment date | | |
|---|---|---|---|
| | 10/22 | 11/7 | 11/25 |
| 1/4# Embark 25 | 2.0 C | 4.3 D | 7.5 A |
| 1/4# MBR-18337 18G | 4.3 B | 6.0 BC | 6.8 A |
| 1/4# MBR-18337 2EC | 3.8 BC | 6.3 B | 6.3 A |
| 1/8# Embark 25 | 2.3 C | 5.0 OD | 6.8 A |
| 1/8# MBR-18337 09G | 5.3 AB | 7.5 A | 6.8 A |
| 1/8# MBR-18337 2EC | 4.5 B | 6.0 BC | 7.3 A |
| Check | 6.8 A | 6.5 B | 7.3 A |

*Table 2. April phytotoxicity ratings of fall applied treatments of Embark and MBR-18337.

| Treatment | Treatment date | | |
|---|---|---|---|
| | 10/22 | 11/7 | 11/25 |
| 1/4# Embark 25 | 2.0 D | 5.5 B | 8.8 A |
| 1/4# MBR-18337 18G | 4.3 BC | 5.3 BC | 7.0 B |
| 1/4# MBR-18337 2EC | 3.0 CD | 5.5 B | 4.3 D |
| 1/8# Embark 25 | 3.5 CD | 6.5 B | 6.3 BC |
| 1/8# MBR-18337 09G | 5.5 B | 6.5 B | 6.0 BC |
| 1/8# MBR-18337 2EC | 4.0 BC | 3.5 C | 4.8 CD |
| Check | 9.0 A | 8.8 A | 8.8 A |

*Table 3. May 2 phytotoxicity ratings of fall applied treatments of Embark and MBR-18337.

| Treatment | Treatment date | | |
|---|---|---|---|
| | 10/22 | 11/7 | 11/25 |
| 1/4# Embark 25 | 2.3 E | 6.8 C | 9.0 A |
| 1/4# MBR-18337 18G | 6.5 B | 8.5 AB | 9.0 A |
| 1/4# MBR-18337 2EC | 4.3 CD | 7.5 ABC | 8.0 A |
| 1/8# Embark 25 | 3.8 DE | 7.0 BC | 9.0 A |
| 1/8# MBR-18337 09G | 7.0 B | 8.5 AB | 9.0 A |
| 1/8# MBR-18337 2EC | 5.8 BC | 7.0 BC | 8.5 A |
| Check | 9.0 A | 9.0 A | 9.0 A |

*NOTE: All table column means followed by the same letter are not significantly different at the 0.01 level of significance according to the DMRT.

Ratings: 1 - poorest, 9 - best

*Table 4. May 25 seedhead inhibition and color ratings of fall applied treatments of Embark and MBR-18337.

| Treatment | Treatment and parameter | | | | | |
|---|---|---|---|---|---|---|
| | 10/22 | | 11/7 | | 11/25 | |
| | Color | Seedheads | Color | Seedheads | Color | Seedheads |
| 1/4# Embark 25 | 3.0 D | 8.8 A | 7.5 B | 5.5 B | 9.0 A | 3.3 C |
| 1/4# MBR-18337 18G | 7.3 AB | 7.8 AB | 9.0 A | 8.3 A | 9.0 A | 5.8 B |
| 1/4# MBR-18337 2EC | 5.3 BC | 8.3 AB | 8.5 AB | 6.3 AB | 8.8 A | 9.0 A |
| 1/8# Embark 25 | 4.8 CD | 7.3 B | 8.3 AB | 5.3 B | 9.0 A | 5.5 B |
| 1/8# MBR-18337 09G | 8.0 A | 7.5 AB | 9.0 A | 7.0 AB | 9.0 A | 8.0 A |
| 1/8# MBR-18337 2EC | 6.8 ABC | 8.3 AB | 8.5 AB | 8.3 A | 9.0 A | 8.0 A |
| Check | 9.0 A | 1.0 C | 9.0 A | 1.0 C | 9.0 A | 2.0 C |

*Table 5. Quality ratings of spring applied treatments of Embark and MBR-18337.

| Treatment | Rating date and parameter | | | |
|---|---|---|---|---|
| | 5/15/81 | 5/21/81 | 5/31/81 | 6/25/81 |
| | Color | Seedhead | Color | Color |
| 1/16# Embark | 8.0 AB | 6.5 A | 8.8 A | 6.8 A |
| 1/16# MBR-18337 | 8.3 AB | 6.3 A | 7.0 B | 7.0 A |
| 1/8# Embark | 7.8 B | 7.5 A | 8.5 A | 6.5 A |
| 1/8# MBR-18337 | 8.3 AB | 7.3 A | 5.8 C | 7.5 A |
| Check | 9.0 A | 1.0 B | 8.0 AB | 4.8 A |

*NOTE: All table column means followed by the same letter are not significantly different at the 0.01 level of significance according to the DMRT.

Ratings: 1 - poorest, 9 - best