

## Timing of MON 44951 Applications in the Fall for Creeping Bentgrass Control - 2003

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### Background/Objective:

Creeping bentgrass is a problem in golf course roughs. It has been shown that MON 44951 will remove creeping bentgrass from Kentucky bluegrass. The objective of this study was to determine the best timing of application and was a cooperative study between Iowa State University and Purdue University.

### Site Information

|                                       |  |                                    |
|---------------------------------------|--|------------------------------------|
| <b>Location:</b>                      | W.H. Daniel Research and Diagnostic Center |                                    |
| <b>Soil Type:</b>                     | Starks-Fincastle silt loam                 |                                    |
| <b>Soil pH:</b>                       | 7.2  |                                    |
| <b>Soil Organic Matter (%):</b>       | NA   |                                    |
| <b>Turfgrass Species:</b>             | Creeping bentgrass                         | Kentucky bluegrass                 |
| <b>Turf Condition:</b>                | Fair                                       | Fair                               |
| <b>Turf Management:</b>               |  |                                    |
| <b>Mowing Height cm (in):</b>         | 3.8 (1.5)                                  | 6.4 (2.5)                          |
| <b>Fertilization:</b>                 | 3.0 lbs N/1000 ft <sup>2</sup> /yr         | 3.0 lbs N/1000 ft <sup>2</sup> /yr |
| <b>Irrigation:</b>                    | To prevent moisture stress                 |                                    |
| <b>Testing on Site Previous Year:</b> | None                                       | None                               |
| <b>Growth Stage:</b>                  | Mature                                     |                                    |

### Application Information

|   |   |  |
|---|---|--|
| <b>Application Dates:</b>   | 28 Aug, 4 Sep, 11 Sep, 18 Sep, 26 Sep, 2 Oct, 9 Oct, 16 Oct, and 23 Oct |  |
| <b>Spray Volume L ha<sup>-1</sup> (gal 1000 ft<sup>-2</sup>):</b> | 814 (2)   |  |
| <b>Spray Pressure:</b>  | 35psi   |  |
| <b>Spray Nozzle:</b>  | 8001.5  |  |
| <b>Spray Equipment:</b>   | CO <sub>2</sub> backpack  |  |
| <b>Irrigation After Application:</b>                              | None  |  |
| <b>Experimental Design:</b>                                       | Randomized complete block   |  |
| <b>Replications:</b>  | 3   |  |
| <b>Plot Size m (ft):</b>  | 1.5 X 1.5 (5 X 5)   |  |

### Results:

- Since this was only the first year of a two-year study, the study was not fully analyzed as a factorial experiment.
- All applications of MON 44951 except those made in August caused some phytotoxicity to the L93 creeping bentgrass and the most severe phytotoxicity resulted from the 0.50 oz/A rate of MON 44951 (Table 1).
- Significant reductions in creeping bentgrass cover resulted only from applications made after Oct 2 (Table 2)
- Though many of the applications caused noticeable phytotoxicity on Kentucky bluegrass, applications made in October resulted in the most severe phytotoxicity (Table 3). However, unacceptable phytotoxicity occurred from only the 16 Oct application at 0.25 oz/A rate rated only on 14 Nov.
- MON 44951 has a growth regulating effect where Kentucky bluegrass was slightly stunted by applications made in Sept (Table 4)

- This study will be repeated starting in Fall 2004 at both universities, but we'll likely include later applications, sequential applications and higher rates.

**Table 1.** Phytotoxicity<sup>a</sup> of MON44951 to L93 creeping bentgrass mowed at 1.5 inches.

| Treatment                   | Rate of application | Application timing <sup>b</sup> | 4 Sep | 11 Sep | 18 Sep | 25 Sep | 3 Oct | 10 Oct | 17 Oct | 23 Oct | 31 Oct |
|-----------------------------|---------------------|---------------------------------|-------|--------|--------|--------|-------|--------|--------|--------|--------|
|                             | oz/A                |                                 |       |        |        |        |       |        |        |        |        |
| MON 44951 75DF <sup>c</sup> | 0.25                | Aug 28                          | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 9.0    |
| MON 44951 75DF              | 0.5                 | Aug 28                          | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 8.8    | 9.0    |
| MON 44951 75DF              | 0.25                | Sep 4                           | 9.0   | 7.0    | 8.5    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 9.0    |
| MON 44951 75DF              | 0.5                 | Sep 4                           | 9.0   | 6.5    | 7.8    | 8.3    | 9.0   | 9.0    | 9.0    | 9.0    | 9.0    |
| MON 44951 75DF              | 0.25                | Sep 11                          | 9.0   | 9.0    | 8.5    | 8.5    | 9.0   | 9.0    | 9.0    | 9.0    | 9.0    |
| MON 44951 75DF              | 0.5                 | Sep 11                          | 9.0   | 9.0    | 8.5    | 8.3    | 8.3   | 8.8    | 9.0    | 9.0    | 9.0    |
| MON 44951 75DF              | 0.25                | Sep 18                          | 9.0   | 9.0    | 9.0    | 8.3    | 6.3   | 8.3    | 9.0    | 9.0    | 9.0    |
| MON 44951 75DF              | 0.5                 | Sep 18                          | 9.0   | 9.0    | 9.0    | 8.3    | 5.8   | 7.3    | 9.0    | 9.0    | 9.0    |
| MON 44951 75DF              | 0.25                | Sep 26                          | 9.0   | 9.0    | 9.0    | 9.0    | 7.5   | 6.3    | 8.0    | 9.0    | 9.0    |
| MON 44951 75DF              | 0.5                 | Sep 26                          | 9.0   | 9.0    | 9.0    | 9.0    | 7.5   | 5.8    | 8.0    | 8.5    | 8.8    |
| MON 44951 75DF              | 0.25                | Oct 2                           | 9.0   | 9.0    | 9.0    | 9.0    | 8.8   | 7.0    | 8.0    | 7.3    | 9.0    |
| MON 44951 75DF              | 0.5                 | Oct 2                           | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 6.8    | 8.0    | 6.3    | 7.5    |
| MON 44951 75DF              | 0.25                | Oct 9                           | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 8.8    | 6.8    | 7.5    |
| MON 44951 75DF              | 0.5                 | Oct 9                           | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 7.3    | 7.3    |
| MON 44951 75DF              | 0.25                | Oct 16                          | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 7.8    | 7.3    |
| MON 44951 75DF              | 0.5                 | Oct 16                          | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 7.0    | 5.8    |
| MON 44951 75DF              | 0.25                | Oct 23                          | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 9.0    |
| MON 44951 75DF              | 0.5                 | Oct 23                          | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 8.5    |
| Check                       |                     |                                 | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 9.0    |
| Check 2                     |                     |                                 | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 9.0    |
| LSD (0.05)                  |                     |                                 | NS    | 0.3    | 0.4    | 0.5    | 0.5   | 0.6    | 0.4    | 0.8    | 0.9    |

<sup>a</sup> Phytotoxicity was rated on a scale of 1 to 9, where 1 = completely brown, 7 = acceptable damage, and 9 = no phytotoxicity.

<sup>b</sup> Date application was made

<sup>c</sup> The surfactant MON 0818 was included at 0.25 percent volume per volume.

**Table 2.** Cover<sup>a</sup> of L93 creeping bentgrass after application of MON 44951 throughout fall 2003 and spring 2004.

| Treatment                   | Rate of application | Application timing <sup>b</sup> | 14 Nov | 13 Apr |
|-----------------------------|---------------------|---------------------------------|--------|--------|
|                             | oz/A                |                                 | -----% | -----  |
| MON 44951 75DF <sup>c</sup> | 0.25                | Aug 28                          | 91.3   | 90.0   |
| MON 44951 75DF              | 0.5                 | Aug 28                          | 93.8   | 91.3   |
| MON 44951 75DF              | 0.25                | Sep 4                           | 96.5   | 98.0   |
| MON 44951 75DF              | 0.5                 | Sep 4                           | 93.8   | 98.0   |
| MON 44951 75DF              | 0.25                | Sep 11                          | 93.0   | 96.0   |
| MON 44951 75DF              | 0.5                 | Sep 11                          | 97.3   | 98.0   |
| MON 44951 75DF              | 0.25                | Sep 18                          | 96.3   | 95.0   |
| MON 44951 75DF              | 0.5                 | Sep 18                          | 96.8   | 99.0   |
| MON 44951 75DF              | 0.25                | Sep 26                          | 94.8   | 97.0   |
| MON 44951 75DF              | 0.5                 | Sep 26                          | 93.8   | 94.8   |
| MON 44951 75DF              | 0.25                | Oct 2                           | 94.3   | 96.8   |
| MON 44951 75DF              | 0.5                 | Oct 2                           | 90.8   | 97.0   |
| MON 44951 75DF              | 0.25                | Oct 9                           | 81.3   | 91.3   |
| MON 44951 75DF              | 0.5                 | Oct 9                           | 77.5   | 85.0   |
| MON 44951 75DF              | 0.25                | Oct 16                          | 73.8   | 81.3   |
| MON 44951 75DF              | 0.5                 | Oct 16                          | 63.8   | 65.0   |
| MON 44951 75DF              | 0.25                | Oct 23                          | 86.3   | 80.0   |
| MON 44951 75DF              | 0.5                 | Oct 23                          | 81.3   | 73.8   |
| Check                       |                     |                                 | 93.8   | 93.5   |
| Check 2                     |                     |                                 | 95.3   | 96.8   |
| LSD (0.05)                  |                     |                                 | 1.0    | 5.8    |

<sup>a</sup> Percent of the plot area covered by creeping bentgrass.

<sup>b</sup> Date application was made

<sup>c</sup> The surfactant MON 0818 was included at 0.25 percent volume per volume.

**Table 3.** Phytotoxicity<sup>a</sup> on America Kentucky bluegrass after application of MON 44951 throughout Fall 2003.

| Treatment                   | Rate of application | Application timing <sup>b</sup> | 4 Sep | 11 Sep | 18 Sep | 25 Sep | 2 Oct | 10 Oct | 17 Oct | 23 Oct | 31 Oct | 14 Nov |
|-----------------------------|---------------------|---------------------------------|-------|--------|--------|--------|-------|--------|--------|--------|--------|--------|
|                             | oz/A                |                                 |       |        |        |        |       |        |        |        |        |        |
| MON 44951 75DF <sup>c</sup> | 0.25                | Aug 28                          | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 9.0    | 8.8    |
| MON 44951 75DF              | 0.5                 | Aug 28                          | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 9.0    | 9.0    |
| MON 44951 75DF              | 0.25                | Sep 4                           | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 9.0    | 9.0    |
| MON 44951 75DF              | 0.5                 | Sep 4                           | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 9.0    | 9.0    |
| MON 44951 75DF              | 0.25                | Sep 11                          | 9.0   | 9.0    | 9.0    | 8.8    | 9.0   | 8.8    | 9.0    | 9.0    | 9.0    | 8.8    |
| MON 44951 75DF              | 0.5                 | Sep 11                          | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 9.0    | 9.0    |
| MON 44951 75DF              | 0.25                | Sep 18                          | 9.0   | 9.0    | 9.0    | 8.5    | 8.8   | 9.0    | 9.0    | 9.0    | 9.0    | 9.0    |
| MON 44951 75DF              | 0.5                 | Sep 18                          | 9.0   | 9.0    | 9.0    | 8.0    | 9.0   | 8.5    | 9.0    | 9.0    | 9.0    | 9.0    |
| MON 44951 75DF              | 0.25                | Sep 26                          | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 9.0    | 8.8    |
| MON 44951 75DF              | 0.5                 | Sep 26                          | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 8.3    | 8.8    | 9.0    | 8.8    | 9.0    |
| MON 44951 75DF              | 0.25                | Oct 2                           | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 8.5    | 8.5    | 9.0    | 9.0    | 8.8    |
| MON 44951 75DF              | 0.5                 | Oct 2                           | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 8.5    | 8.3    | 9.0    | 8.5    | 8.8    |
| MON 44951 75DF              | 0.25                | Oct 9                           | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 8.3    | 7.5    |
| MON 44951 75DF              | 0.5                 | Oct 9                           | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 8.8    | 9.0    | 8.0    | 7.3    |
| MON 44951 75DF              | 0.25                | Oct 16                          | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 8.5    | 6.8    |
| MON 44951 75DF              | 0.5                 | Oct 16                          | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 8.3    | 7.0    |
| MON 44951 75DF              | 0.25                | Oct 23                          | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 9.0    | 7.8    |
| MON 44951 75DF              | 0.5                 | Oct 23                          | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 8.5    | 7.8    |
| Check                       |                     |                                 | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 9.0    | 8.8    |
| Check 2                     |                     |                                 | 9.0   | 9.0    | 9.0    | 9.0    | 9.0   | 9.0    | 9.0    | 9.0    | 9.0    | 8.8    |
| LSD (0.05)                  |                     |                                 | NS    | NS     | NS     | 0.2    | 0.2   | 0.4    | 0.3    | NS     | 0.6    | 0.6    |

<sup>a</sup> Phytotoxicity was rated on a scale of 1 to 9, where 1 = completely brown, 7 = acceptable damage, and 9 = no phytotoxicity.

<sup>b</sup> Date application was made

<sup>c</sup> The surfactant MON 0818 was included at 0.25 percent volume per volume.

**Table 4.** Stunting<sup>a</sup> of America Kentucky bluegrass after application of MON 44951 throughout Fall 2003.

| Treatment                   | Rate of application | Application timing <sup>b</sup> | 11 Sep | 18 Sep | 25 Sep | 2 Oct |
|-----------------------------|---------------------|---------------------------------|--------|--------|--------|-------|
|                             | oz product/A        |                                 |        |        |        |       |
| MON 44951 75DF <sup>c</sup> | 0.25                | Aug 28                          | 2.0    | 2.0    | 2.0    | 2.0   |
| MON 44951 75DF              | 0.5                 | Aug 28                          | 2.0    | 2.0    | 2.0    | 2.0   |
| MON 44951 75DF              | 0.25                | Sep 4                           | 1.3    | 1.5    | 1.8    | 2.0   |
| MON 44951 75DF              | 0.5                 | Sep 4                           | 1.0    | 1.3    | 1.0    | 1.8   |
| MON 44951 75DF              | 0.25                | Sep 11                          | 2.0    | 2.0    | 1.0    | 2.0   |
| MON 44951 75DF              | 0.5                 | Sep 11                          | 2.0    | 2.0    | 1.0    | 1.8   |
| MON 44951 75DF              | 0.25                | Sep 18                          | 2.0    | 2.0    | 1.3    | 1.5   |
| MON 44951 75DF              | 0.5                 | Sep 18                          | 2.0    | 2.0    | 1.0    | 1.3   |
| MON 44951 75DF              | 0.25                | Sep 26                          | 2.0    | 2.0    | 2.0    | 2.0   |
| MON 44951 75DF              | 0.5                 | Sep 26                          | 2.0    | 2.0    | 2.0    | 1.8   |
| MON 44951 75DF              | 0.25                | Oct 2                           | 2.0    | 2.0    | 2.0    | 2.0   |
| MON 44951 75DF              | 0.5                 | Oct 2                           | 2.0    | 2.0    | 2.0    | 2.0   |
| MON 44951 75DF              | 0.25                | Oct 9                           | 2.0    | 2.0    | 2.0    | 2.0   |
| MON 44951 75DF              | 0.5                 | Oct 9                           | 2.0    | 2.0    | 2.0    | 2.0   |
| MON 44951 75DF              | 0.25                | Oct 16                          | 2.0    | 2.0    | 2.0    | 2.0   |
| MON 44951 75DF              | 0.5                 | Oct 16                          | 2.0    | 2.0    | 2.0    | 2.0   |
| MON 44951 75DF              | 0.25                | Oct 23                          | 2.0    | 2.0    | 2.0    | 2.0   |
| MON 44951 75DF              | 0.5                 | Oct 23                          | 2.0    | 2.0    | 2.0    | 2.0   |
| Check                       |                     |                                 | 2.0    | 2.0    | 2.0    | 2.0   |
| Check 2                     |                     |                                 | 2.0    | 2.0    | 2.0    | 2.0   |
| LSD (0.05)                  |                     |                                 | 0.2    | 0.2    | 0.2    | 0.4   |

<sup>a</sup> Stunting was rated as 1 = reduced top growth and 2 = no effect.

<sup>b</sup> Date application was made

<sup>c</sup> The surfactant MON 0818 was included at 0.25 percent volume per volume.