

**Effect of Plant Growth Regulators and Application Timing Annual Bluegrass  
Seedhead Suppression & Injury  
2005-2006**

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**Objective**

The Central New York Golf Course Superintendents Association provided funding to conduct a field study designed to evaluate the effect of product and application timing on annual bluegrass seedhead suppression and injury. The study was conducted at two locations with the cooperation of Bob Marshall at Skaneateles Country Club and Jeff Corcoran at Oak Hill Country Club.

**Methodology**

Two plant growth regulators (Embark and Proxy) were applied with and without Primo or Macro-Sorb Foliar in a completely randomized design with three replications. Treatments were applied to a mixed stand of creeping bentgrass and annual bluegrass. The Oak Hill site was a sand-based green, and Skaneateles was a soil-based green with and topdressing.

Initial applications were made on April 13, 2005. Identical applications were made (on different plots) on April 19, April 21, April 27, May 10 and May 17. Base 32 growing degree days were used to differentiate application timings. Treatments were applied with a handheld CO<sub>2</sub> sprayer at 40 psi (276 kPa) fitted with TeeJet XR8015 nozzles calibrated to deliver 2 gallons (7.6 liters) of water per 1,000 ft<sup>2</sup> (92.9 m<sup>2</sup>).

Golf course personnel maintained plots to championship conditions. Data were collected for % seedhead population and turfgrass injury on a scale of 1 to 9 with 1=no injury, 9=completely dead and 4= objectionable.

Table 1. Treatments applied at two locations at five different times.

Trt#	Product	Rate/1000 (ounces)
1	Control	
2	Proxy	5
3	Proxy+Primo	5/0.125
4	Proxy+Primo+MacroSorb Foliar	5/0.125/4
5	Embark	0.1
6	Embark+Primo	0.1/0.125
7	Embark+Primo+MacroSorb Foliar	0.1/0.125/4

## Results

### Summary of 2005 results

The spring of 2005 was characterized by extremely variable environmental conditions. The result was a delayed, sporadic and very defined period of seedhead development. This variability in environmental conditions produced significant variability in most of the Proxy treatments. However, there was a trend that greater suppression was achieved when treatments were applied between 400 and 500 base 32 GDD and applied with Primo.

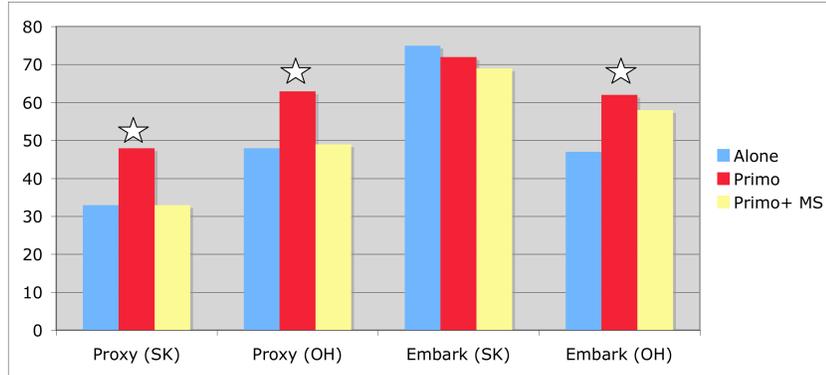


Figure 1. Effect of Proxy and Embark applied alone or in tank mix combination with Primo and or Macrosorb Foliar on annual bluegrass seedhead suppression.

The star in Figure 1 indicates significant differences within either the Proxy or Embark regime at a particular location. Clearly, Proxy and Primo provided significantly greater seedhead suppression from a well-timed single application independent of location. Still, the suppression levels did not exceed 65 percent. One might imagine a follow up application might enhance intensity and duration of control.

The Embark treatments provided more consistent and less variable seedhead suppression as compared to the Proxy treatments. The addition of Primo with and without Macro-Sorb enhanced amount and duration of suppression compared to Embark applied alone at Oak Hill location. Embark treatments were most effective when applied between 500 and 600 base 32 GDD.

## 2006 Results

### Proxy at Skaneateles CC

As compared to 2005 results, Proxy applied alone at Skaneateles CC (SCC) provided significantly higher levels and extended period annual bluegrass seedhead suppression. Peak suppression was 83 percent for seven weeks when applied at 436 base 32 GDD (April 12, 2006).

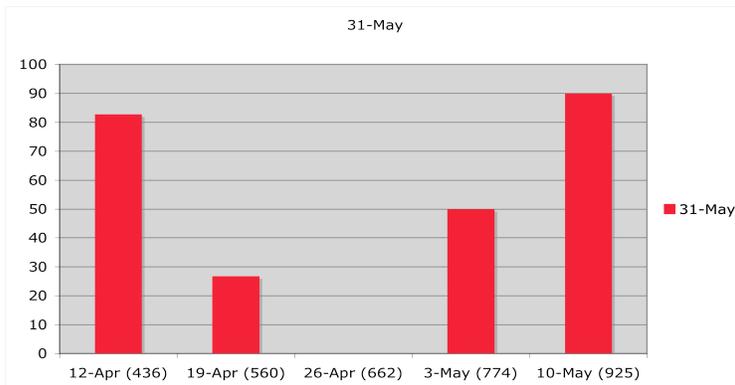


Figure 2. Effect of application date on annual bluegrass seedhead suppression with Proxy at Skaneateles CC.

The later application dates past 500 base 32 GDD were significantly less effective than 2005 suggesting that the seedhead emergence pattern was more defined and less persistent.

### Proxy at Oak Hill CC

Delayed application timing due to early season rainfall reduced overall suppression levels from Proxy applied alone to 2005 levels as compared to suppression achieved at 2006 SCC application dates.

However, up to 55 percent suppression (Figure 3) was achieved from a single application applied well past the suggested 400-500 base 32 GDD ideal timing model.

This suggests that Proxy applied alone can be effective at reducing seedhead levels by 50 percent up to 750 base 32 GDD.

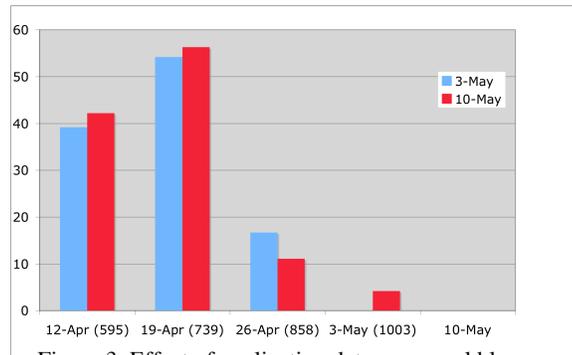


Figure 3. Effect of application date on annual bluegrass seedhead suppression with Proxy at Oak Hill CC.

### Proxy plus Primo at Skaneateles CC

The addition of Primo to the Proxy application did not enhance level of seedhead suppression but did extend the duration of suppression from six to eight weeks from a single application. Primo was still applied at Skaneateles as part of the nutrient management of the putting surface every two weeks for the duration of the study.

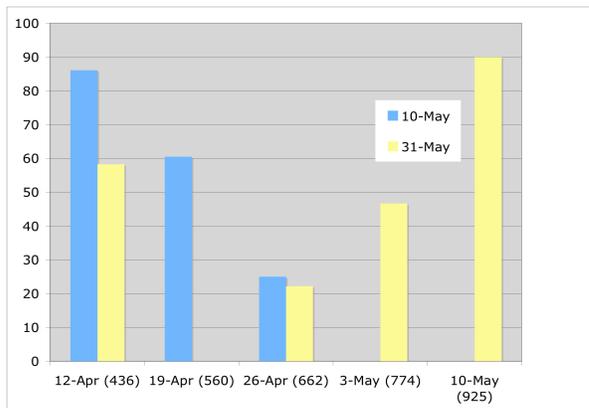


Figure 4. Effect of application date on annual bluegrass seedhead suppression with Proxy plus Primo at Skaneateles CC.

Again, as with Proxy applied alone, this data indicates much greater suppression in 2006 with this combination as compared to 2005. Average suppression from the Proxy plus Primo combination was 75 percent for four to seven weeks without objectionable injury.

### Proxy plus Primo at Oak Hill CC

In contrast to the Proxy plus Primo applications at SCC the addition of Primo at Oak Hill appeared to increase both level and length of seedhead suppression to as much as 70 percent for four to six weeks (Figure 5). This is a significant finding as it indicates that Primo might extend the application window for seedhead suppression.

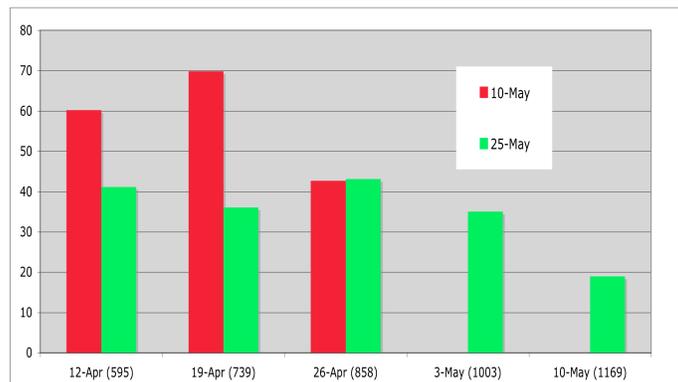


Figure 5. Effect of application date on annual bluegrass seedhead suppression with Proxy plus Primo at Oak Hill CC.

### Embark at Skaneateles CC

The Embark treatments at SCC provided greater than 70 percent seedhead suppression for three to five weeks from a single application applied between 430 and 560 base 32 GDD (Figure 6) without objectionable injury. This is not consistent with previous work that suggested greater than 500 base 32 GDD was required for maximum suppression.

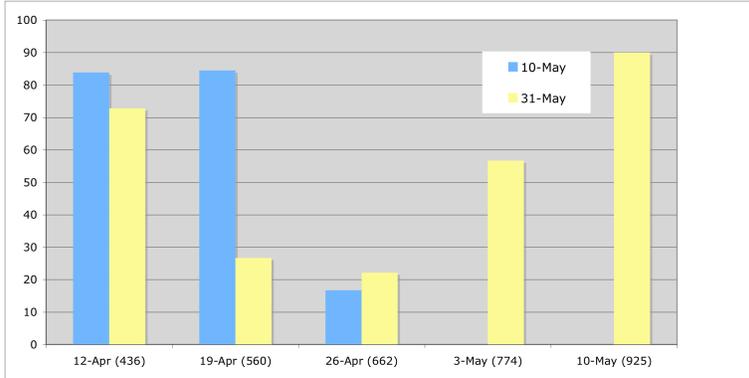


Figure 6. Effect of application date on annual bluegrass seedhead suppression with Embark at Skaneateles CC.

### Embark at Oak Hill CC

Embark treatments demonstrated the benefit of later application window being much more effective between 500 and 750 base 32 GDD. This treatment provided about 60 percent suppression over a four to seven week period with little to no objectionable injury in 2006.

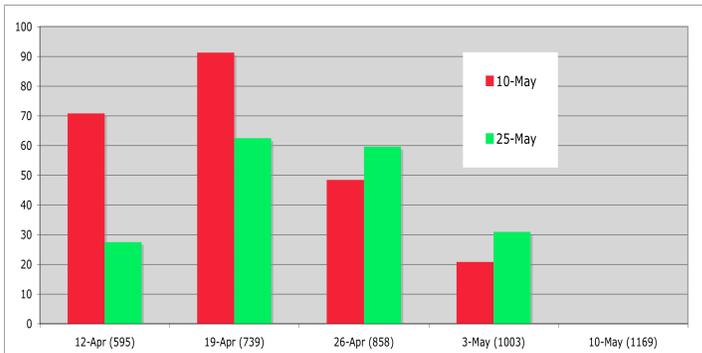


Figure 7. Effect of application date on annual bluegrass seedhead suppression with Embark at Oak Hill CC.

### Embark plus Primo at Skaneateles CC

In contrast to 2005, the Embark plus Primo application at SCC provided slightly less seedhead suppression over the emergence period. However, peak suppression was achieved at a wider application window and peak suppression was greater. It appears the addition of Primo might reduce injury and widen the application window for Embark.

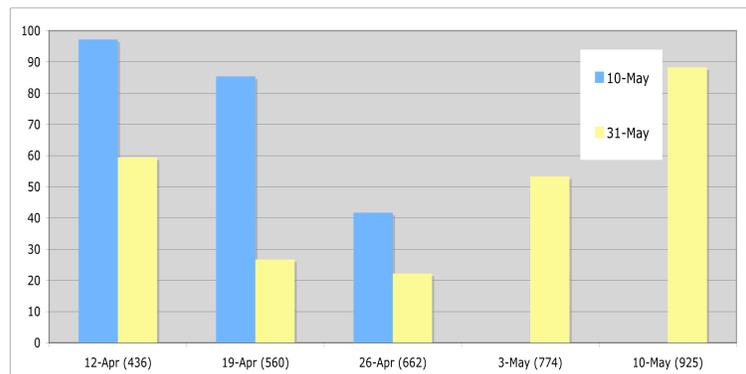


Figure 8. Effect of application date on annual bluegrass seedhead suppression with Embark plus Primo at Skaneateles CC.

## Embark plus Primo at Oak Hill CC

In contrast to 2005, the addition of Primo to the Embark application did not provide significant increase in seedhead suppression when compared to Embark applied alone. However, the treatments were applied slightly later in 2006 as compared to 2005

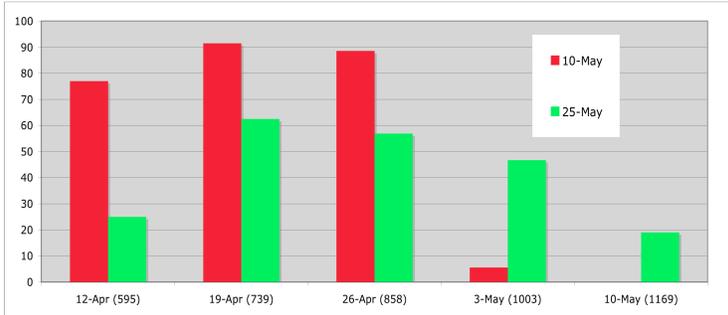


Figure 9. Effect of application timing on annual bluegrass seedhead suppression with Embark plus Primo at Oak Hill CC.

and the seedhead emergence period was more compressed in 2006 than in 2005. The interesting aspect of this treatment continued to be the significant reduction in measurable injury and the potential to widen the application window with Embark.

## MacroSorb Treatment

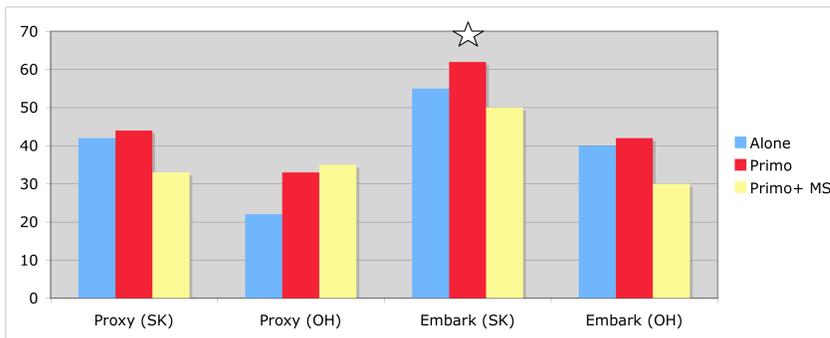
The addition of Nutramax MacroSorb Foliar in 2005 did not reveal improvements, mostly due to regular rate used. In 2006, application rates of Embark and Proxy were reduced to determine if the MacroSorb enhanced performance at lower rates as has been observed with herbicides.

In some cases reduced rate of the products applied with MacroSorb provided significantly less suppression in intensity and duration, but this was not consistent by product and location. In addition, injury was also reduced justifying further research with this additive.

## 2006 Summary

The significant main effect of year precludes the ability to make an overall conclusion based on two season's data. In contrast to 2005, the 2006 results did not reveal a significant improvement in intensity and duration of seedhead suppression. Only the Embark plus Primo treatment at SCC provided significantly greater seedhead suppression compared to Embark alone.

Embark provided higher levels of seedhead suppression in both years compared to Proxy treatments. Some injury was observed in both years, however it did not rise to level of objectionable both in the data and based on conversation with golf course



superintendents.

Based on the results of this two study ideal timing for seedhead suppression with Proxy appears to be between 400 and 600 base 32 growing degree days and ideal timing for Embark is

500 to 650. The use of Primo seems to extend the window as well as the duration of suppression with both products as well as being an important tool for maintaining annual bluegrass health.