



# Making Sense of the Primo Maxx Research at UW

By **Bill Kreuser**, Graduate Student, Department of Soil Science, University of Wisconsin - Madison

Over the past few years I have conducted several Primo Maxx research studies at the OJ Noer Turfgrass Research Facility with Drs. Wayne Kussow and Doug Soldat. Every study has helped answer questions about the effect Primo Maxx has on turfgrass growth, color, and quality. There is a fair amount of information that can be a quite overwhelming and at times hard to comprehend. During the past summer several golf course superintendents have asked questions about our research so I decided to address some of the most common questions here.

## How Long Does Primo Maxx Reduce Putting Green Clipping Production?

The label states that re-applying Primo Maxx every four weeks will maintain a 50% clipping reduction. However many turfgrass managers have seen a dramatic increase in putting green clipping production sooner than four weeks after the last application. This is especially true during midsummer. The truth of the matter is that Primo's longevity is controlled by plant metabolism and not by a calendar. The rate of plant metabolism is related to temperature. Increasing temperature by only 18°F doubles the rate of plant metabolism which includes the rate of Primo degradation. The daily average air temperature for Madison, WI during the month of May is 57°F or 14°C while in July the average temperature is 71°F or 22°C. According to our data, this means that Primo will effectively reduce clipping production on bentgrass putting greens for 18 days in May and only 11 days during an average July. After the reduction phase the bentgrass putting greens experience a rebound phase of increased clipping production compared to untreated grass. Typically this rebound phase lasts as long as the reduction phase did. For example during a hot stretch of weather (think: Pythium), Primo will cause growth suppression for a week followed by one week of increased putting green growth. The result being no net reduction in growth, and possibly a net increase.

It is also important to consider grass species when thinking about the Primo longevity. Branham and Beasley (2007) found that creeping bentgrass and Kentucky bluegrass metabolize Primo at different rates. [DSS1]We are finding this to be true regarding annual bluegrass and creeping bentgrass. *Poa annua* is metabolizing Primo quicker than the creeping bentgrass. The

net effect is *Poa* enters the rebound phase while the bentgrass is still in the suppression phase of growth. This may give the *Poa* a competitive advantage over the desirable creeping bentgrass. To minimize this advantage Primo needs to be re-applied sooner before the *Poa* enters the rebound phase. This was easier said than done because it is difficult to predict the metabolism of Primo by the turfgrass until now.

## How can a growing degree day system help with my Primo Maxx applications?

A growing degree day (GDD) system is helpful when using Primo because it predicts Primo's effect on turf growth. The system is very simple to use. After Primo is applied the daily average air temperatures are added together until Primo is re-applied. At that point the model is reset to 0 and the process is repeated. The temperatures are recorded in degrees Celsius with a base temperature of 0°C. The model has been calibrated and validated over the past few summer on several creeping bentgrass putting greens.

Initially after Primo application to creeping bentgrass putting greens, 0-50 GDD units, the turfgrass enters the growth suppression phase. This suppression phase will remain until approximately 200 GDD units after Primo application. Between 200 and 300 GDD units the turfgrass will transition into the rebound phase. This rebound phase will continue until 500 GDD units after treatment. Past 500 GDD units the turfgrass grows similarly to the untreated control. *Poa annua* putting greens exhibit the same cycle but on a shorter timeframe.

Keeping track of the daily air temperatures can provide a very simple and effective way to monitoring the influence Primo is having on your bentgrass putting greens. This can be useful for several situations. For example, to maintain consistent growth regulation during a growing season Primo should be re-applied every 200 GDD units. If the greens are *Poa annua* Primo should be re-applied every 150 GDD because the *Poa* metabolizes Primo quicker. Knowledge of when the rebound phase will occur can also be useful in aiding in recovery from cultural practices such as top-dressing or aerification. Withholding a practice like aerification or vertical mowing until the rebound phase (300 GDD) can aid in turfgrass recovery in similarly to application of a nitrogen fertilizer.

**Does application rate affect growth rate or the growing degree day model?**

No, at least when talking about grass maintained at putting green height. We have applied Primo at the labeled rate of 0.125 fl oz of product per 1000 ft<sup>2</sup> (5.4 fl oz/M) for two years now and have measured a 20% reduction in clipping production on bentgrass putting greens. Typically the maximum amount of growth suppression occurs about 125-150 GDD units after application. This year we have applied Primo at double the labeled rate, 0.25 fl oz/M, and four times the labeled rate, 0.50 fl oz/M. We expected that the increased rate would lead to an increased level of growth suppression. This didn't occur. All three application rates provided a 20% reduction in clipping production. Additionally, increased application rate hasn't affected the duration of the suppression phase. The bottom line is that applying Primo to closely mown putting greens at a rate above 0.125 fl oz/M is not effective. Next season, we will evaluate the effectiveness of reduced rates.

**Is mowing height important?**

Yes. Primo only enters the plant through the foliage. We hypothesized that the small amount of leaf area on a putting green may limit the amount of Primo the

plant can absorb. This isn't a new phenomenon to the turf industry. For example the herbicide Velocity isn't very effective at putting green height because of the limited leaf area to absorb the product (Branham and Calhoun, 2005). To test this we created a study that had three different application rates and two mowing height. The grass mowed to 0.125" experiences the expected 20% reduction in growth across all application rates. However the plots mowed to 0.250" about double the reduction (40%) in clipping production. The high Primo rate (0.500 fl oz/M) at the 0.250 inch mowing height has experienced up to a 65% reduction in growth. Another interesting phenomenon we've seen is that the grass at the higher mowing height is growing about half as fast as the grass at green height.

**Does Primo Maxx affect putting green nitrogen and phosphorus fertility requirements?**

Yes and No. Much like nitrogen, Primo enhances putting green color and visual quality. When re-applied every 200 GDD those enhancements remain constant throughout the growing season. However it takes at least four weeks of constant suppression for the increased color and quality to become apparent. If Primo isn't applied every 200 GDD these enhanced

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qualities are not apparent because the grass is constantly transitioning between the suppression and rebound phases.

We have found that Primo, when applied every 200 GDD, enhances color and quality to a level similar to doubling the nitrogen fertilizer rate. Additionally the clipping production is similar to cutting the nitrogen rate in half. For example there are plots at Noer that receive 0.2 pounds of nitrogen (N) per 1000 ft<sup>2</sup> every two weeks and have 0.25 fl oz of Primo applied per 1000 ft<sup>2</sup> every 200 GDD. These plots have similar color and quality to the plots that receive 0.4 pounds N 1000 ft<sup>2</sup> every two weeks but receive no Primo. At the same time those plots produce similar clipping masses as plots that receive 0.1 pounds N 1000 ft<sup>2</sup> every two weeks but receive no Primo. Using the GDD model is important to experience these results. We conducted this research for two years prior except Primo was re-applied every three weeks and didn't see these results. Using Primo and a GDD system can be a useful way to reduce putting green nitrogen requirements.

Although Primo can reduce putting green nitrogen requirements it hasn't had an effect on the critical soil test phosphorus requirements. It was hypothesized that the Primo induced reduced growth rate would allow the plant to better acquire and cycle phosphorus. However this hasn't been the case over the past year and a half. Phosphorus deficiency symptoms appear much like the flipping of a light switch. On our particular green, once soil test levels drop below 10 ppm Mehlich-3 P the tell-tale blue color of phosphorus deficiency becomes obvious regardless of Primo application. To date Primo hasn't affected critical soil test phosphorus requirements

**In Summary**

- Primo Maxx influences growth in two phases; a suppression phase followed by a rebound phase of increased turfgrass growth compared to an untreated control.
- The length of the growth suppression phase in influenced by air temperature not a calendar.
- Using a simple growing degree day model can be a useful tool to predict the level of growth regulation on a golf putting green. Before 250 GDD units the grass growth is suppress and after 250 GDD units growth is enhanced on a creeping bentgrass putting green.
- Re-applying Primo every 200 GDD units will provide consistent growth suppression on a creeping bentgrass putting green during a growing season. It is impractical to re-apply Primo on exactly 200 GDD in a golf course setting. However the GDD model can be like a fuel gauge. When the Primo fuel gauge is getting near empty it is time add Primo to the next spray tank.

- Mowing higher will lead to slower growth in general, and increased growth suppression when Primo is applied. Applying Primo at rates greater than 0.125 fl oz/M will not result in increased growth suppression on golf course putting greens.
- Re-applying Primo every 200 GDD provides a constant boost in turfgrass color and quality in a similar as increased nitrogen fertilization. Re-applying Primo properly can reduce nitrogen fertilization requirements substantially.

If you have any further questions about our Primo research please feel free to contact me at [wkreuser@wisc.edu](mailto:wkreuser@wisc.edu).

**References:**

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