PLANT GROWTH REGULATORS

Bruce Branham
Department Crop and Soil Science
Michigan State University
East Lansing, Michigan

Plant growth regulators (PGR's) are agrochemicals used to control plant growth. Interest in these compounds has been renewed because of the recent introduction of a new PGR, Primo , from Ciba-Geigy. Currently available PGR's (Table 1) are conveniently classified as either Type I or Type II PGR's. Type I PGR's such as Embark inhibit both cell division and cell elongation. Thus, both seedhead (cell division) and leaf growth (cell elongation) are inhibited. Type II PGR's inhibit only cell elongation. Type II PGR's are getting the most use because they tend to have the best growth reduction without causing excessive turf injury or discoloration. Type I PGR's have a tendency to cause more severe yellowing or injury to the turf.

Table 1. Currently available plant growth regulators

Type I	Type II
Embark	Cutless
	Scott's TGR
	Primo

When using a PGR, several turf responses are commonly observed. First, there may be a period after application, which usually occurs about one week after application, when the turf is discolored by the PGR application. Typically this injury only lasts for 1-2 weeks. After this period, the PGR treated turf will take on a deep green color which is even darker than a well-fertilized but untreated turf. This deep green color will last until the PGR effects wear off. Following the period of growth regulation, many turf managers observe a burst of leaf growth that surpasses the growth rate of unregulated turf.

For the Lawn Care Industry, the most important use of a PGR is for clipping and growth reduction. In the golf course market, PGR's have been used for other purposes such as increasing putting green speed or reducing the *Poa annua* populations. Several factors need to be considered when using a PGR including timing of application, length and duration of growth suppression, and the possibility of environmental or mechanical (i.e. traffic) stress being imposed on the regulated turf. Application timing is very important in determining the success of a PGR application. When using Embark, a type I PGR, seedhead suppression is usually desired and so the application must be made prior to the initiation of seedhead development. While individual turfgrass species vary somewhat in this regard, most cool-season turfgrasses produce seedheads in mid- to late May. Applications need to be made after the turf has fully greened up but before the seedhead begins to elongate within the leaf sheath of the plant. A fairly narrow window of application results from these two constraints. Type II PGR's generally have a broader window of application because seedhead control is not possible and growth suppression is the only object. Here too, however, seedheads can present a problem. If a type II PGR is applied before seedheads emerge, then the seedhead may emerge and not elongate thus staying below the height of cut. Seedheads can then persist for several weeks when they would normally be removed by mowing. Applying a type II PGR prior to seedhead production can result in this problem. While the application window for a type II PGR is generally broader than a type I PGR, the logical time to use these products is in the early spring when turf growth is rapid and frequent rains can often prevent timely mowing. The other possible time frame for use would be in the late summer as turf growth increases following the summer stress period. However, the rate of turf growth seen at this time is generally low enough that a PGR is not necessary in a home lawn or commercial turf site.

Duration and intensity of growth regulation is determined by the choice of the PGR and the rate used. Duration of growth regulation is the length of time the growth of the turf is reduced compared to an untreated control. Intensity of growth regulation is the percentage of growth reduction compared to an untreated control. These two factors are closely related but it is important to note the distinction between them. A turf that has its growth rate reduced by 50% for four weeks is only moderately suppressed and would probably exhibit good turf quality over that time frame. On the other hand, a turf with a 90% reduction in growth over four weeks will probably suffer a serious loss in turf quality. The intensity of growth reduction over that four week span is quite different and the turf quality will reflect that difference. The turf that is more severely regulated will usually exhibit a longer period of growth regulation but often this difference may only be a week or two. Therefore, when using PGR's it is important to know how much growth suppression you want to achieve and what will be the effect on turf quality when reaching that goal.

This relationship between growth suppression and turf quality has hindered the use of PGR's in home lawn turf. When trying to sell a growth regulator, exaggerated claims on the level of growth suppression have often been made. Most homeowners have often been misled into believing that after a PGR application no mowing will be necessary for 4-6 weeks. This level of growth suppression will result in poor turf quality. The currently used PGR's work best when growth is reduced by 40-60% thus reducing the number of mowings and the quantity of clippings produced (Table 2&3). With this approach turf quality is often not only equal to an untreated turf but may actually improve the turf quality compared to an untreated turf (Table 3).

Growth regulators require some knowledge of their performance before using them on a customer's lawn. Begin by experimenting on a few lawns and track the results. With the ban on clipping disposal into landfills a reality in most states, the use of PGR's to reduce clipping volume should be given consideration.

Table 2. Effect of Primo and Primo plus nitrogen applications on the number of mowings per week of a Kentucky bluegrass turf.

	Number of mowings per week			
Treatment	2 WAT	3 WAT	4 WAT	5 WAT
Control	1	2	1	0.7
Primo	0.3	1.3	0	0
Primo + 0.5 lb N / M	0.7	1	0	0.3
Primo + 0.5 lb N / M + Agriplex	0.7	1	0	0.3
LSD (P=0.05)	ns	ns	ns	ns

Table 3. Effect of Primo and Primo plus nitrogen applications on the quality of a Kentucky bluegrass turf.

	Turf Quality (1-9 with 9=best quality)			
Treatment	2 WAT	3 WAT	4 WAT	5 WAT
Control	5.0	5.2	4.8	5.5
Primo	5.3	5.7	5.7	6.0
Primo + 0.5 lb N / M	6.0	7.0	6.7	6.5
Primo + 0.5 lb N / M + Agriplex	7.7	7.2	7.2	6.5
LSD (P=0.05)	1.1	1.1	1.2	0.8