

## What is it with Plant Growth Regulators?

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It may seem like an odd title for an article, but, during my travels on the golf courses in Wisconsin it is one of the most widely asked questions.

Many superintendents do not understand this technology. It is not because we are not intelligent, not because we don't understand the concept, rather it is simply a case where technology arrives and we are not prepared to integrate it into our management schemes.

Do I use it for clipping reduction? Do I use it for Poa conversion? Do I use it to enhance green speed? Or do I use it because my green chairperson or owner or salesman said I should?

I would like to address these topics in a two-part article. First, I want to review some basic concepts in plant growth regulation, and second, I will discuss their implication in golf turf management and inform you about some of our research in this area.

Let's start at the very basics of growth. Plants in general create biomass (leaves, stems, roots, flowers) by producing new cells from existing cells which divide (cell division). Cell division increases the number of cells. Once the plant has new cells, these cells must stretch or elongate to make new organs (leaves, roots, flowers) by a process called cell elongation. These processes are indirectly regulated by a plant hormone, gibberillic acid (GA), much like our hormones regulate hair growth and the female reproductive cycle. As GA levels increase, growth (division and elongation) occurs and the plant creates new biomass.

Turfgrass growth regulation began as an idea some 50 years ago, probably by some disgruntled

homeowner who was tired of mowing. One of the first products used successfully in turf was maleic hydrazide (MH). MH suppressed foliar growth and seedhead formation of roadside vegetation. More recently, Mefluidide (*Embark & Embark Lite*) has been used primarily for *Poa annua* seedhead suppression on golf courses.

Mefluidide is absorbed by the leaves, most effectively at the base of the leaves, and does not move through the plant; this makes thorough spray coverage essential. Once it penetrates the leaf it begins to affect both cell division and cell elongation. Consequently, when it contacts a flowering stem (*Poa* seedhead) during formation (this fact makes timing essential) it causes it to distort and prevents seedhead emergence from the leaf sheath. Products which exhibit this type of activity are classified as **Type I Growth Regulators**, of which Mefluidide is the most common.

The other popular class of PGRs includes the materials which also act by inhibiting GA synthesis, but, apparently to a lesser degree than Mefluidide. This is evidenced by the suppression of cell elongation but not cell division. Products which exhibit this type of activity are classified as **Type II Growth Regulators**. Products in this class include Flurprimidol (*Cutless*), Paclobutrazol (*Turf Enhancer & TGR* active ingredient), and a new material—Cinmectacarb (*Primo*). Because these products primarily affect cell elongation and not division, the number of new cells is only slightly reduced while their ability to elongate is significantly altered. So, you get more small cells. This explains the altered morphol-

ogy of the turf leaves (wider leaf blades) and the short stumpy appearance of the plants (reduced internode length—the distance between new leaves). There is also some experimental evidence that indicates stolons of treated plants become more prostrate and rosettelike (like a witches broom). *Cutless* and *Turf Enhancer* are both primarily root-absorbed, while *Primo* is being advertised as primarily foliar absorbed. This could be a significant strategic use aspect in terms of the length and flexibility of regulation (more on this in my next article). The other significant factor in the use of PGRs is that they exhibit different degrees of regulation depending on the turf species. This is kind of a hassle for landscapers who want to regulate the growth of the entire mixed species home lawn; however, for the golf course superintendent it couldn't be a better deal. We thought.

The concept of regulating turfgrass growth goes right to the heart of what makes grass such a unique biological system. Grasses are constantly creating new biomass. Therefore, when using these products a manager must understand that there are trade-offs in quality and vigor which, if not compensated for, can make for some unhappy golfers. Be clear as to why you are using them. As I mentioned, there are various reasons for using them. Some are theoretically sound, others not so sound.

In my next article I will discuss management aspects of using PGRs for clipping reduction, green speed enhancement, and *Poa* conversion programs.