Growth Regulators

Research is paying off. Growth regulators reduce mowing frequency and suppress seedhead formation on weeds.

By R.P. Freeborg, Ph.D.

Discoloration by growth regulators is the result of slower growing new foliage not covering up naturally dying older foliage.

At Purdue University we began examining growth regulator compounds in the late 1960's to early 70's. At first, the initial objective was to find a growth regulator that would either eliminate or reduce the frequency of the mowing required, thus reducing fuel and labor costs and equipment depreciation. So far, we have not found a compound that can satisfactorily eliminate mowing entirely. Our efforts have more recently been directed at finding a growth regulator that will reduce the mowing frequency requirement to perhaps every third or fourth week within a three month period. The mowing would be in the nature of a trim to improve the appearance of the turf, giving it a better character, color, and uniformity.

The work done with growth regulator compounds has uncovered other important areas outside the turf industry. These formulations can, for example, enhance the sucrose content of sugar cane as well as increase the nutritional value of forage crops. Some growth regulators have also been found to be capable of seedhead suppression which aids in weed control and reduction of weed competition. These discoveries have given rise to added incentive in the development of such compounds.

With some of the growth regulators we have examined we can inhibit a plant to almost any extent without complete kill. All the compounds we have tested will cause inhibition and reduction of growth. Some do so quite severely, but others will actually make a miniature plant that survives through almost any kind of environmental condition.

A compound that will be available in limited quantity this year is presently identified as EL500. It has proved to be a very good growth inhibitor. It enhances the color of the plant and promotes an improved root system. Our test plots have gone ninety days without mowing and without thinning or discoloration of the turf. This product will be marketed under an experimental use permit as "Cutless" from Elanco.

As we examine growth regulators we must also be concerned about what is happening to the plant under the surface of the soil. We need to know what the compound is doing to the tillers, rhizomes, and roots. To accomplish this we have established a greenhouse test wherein sprigs of bluegrass (all taken from one clone to eliminate variability) are planted and then treated with a growth regulator. Thirty days after treatment we harvest them, meas-

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Dwarf grass plants are the result of Ethephon, which keeps all parts of the plant growing equally.

ure top growth, count rhizomes and tillers, and evaluate root development.

EL500 performed very well in this test. The plants treated with this product had dark green color, adequate inhibition, and an exceptionally healthy root system. Failure to inhibit seedhead development seems to be the only major drawback to EL500. The same is true of PP333, another promising compound which is not as yet as fully developed in the turfgrass industry. It is a product of ICI Americas.

A growth regulator that has interested us for some years is Ethephon, sold as Ethrel by Union Carbide. It is used in many agricultural areas to enhance ripening of fruit. One of its unique characteristics is that it tends to dwarf the plant moderately. Compared to other growth regulators it does not have the potential for as prolonged a period of inhibition, but it does keep all parts of the plant growing about equally. A major difficulty is the tendency toward species response, so that if you have a bluegrass, rye, fescue mix, you will find that each is inhibited at a different rate. This results in surface irregularities.

A more recent development in growth regulators has come from Monsanto, and is identified as MON4621 (wettable powder) or MON4623 (granule). It is a good growth inhibitor, it enhances turf color, and provides good seedhead inhibition. This compound will soon be available to the turf industry on a limited basis under an experimental use permit.

A problem that is associated with the use of growth regulators is in fact the result of their success as inhibitors. In a normal healthy turf new leaf growth continually masks or hides the older lower leaves as they senesce, or die. In an inhibited turf, natural senescence continues at a normal rate, and, if the plant is under stress, the rate will accelerate. The inhibited leaf growth cannot hide the dead foliage, and the result is a thin, discolored turf.

The previously mentioned difference in species response, and this appearance of senesced leaf tissue are problems to be overcome before we will have a good growth regulator on the market.

The ability of most growth regulators to suppress seedhead development has aroused interest in these compounds as a means of controlling a plant species and also reducing mowing requirements. The reduced development of the seed stalk eliminates the need for it to be mowed. Over a period of time by reduction of seed development, weeds like *Poa annua* can eventually be reduced until it becomes low enough to control what remains with a preemergent. With proper timing and use one can effect a potential reduction of new plants in the future. Unfortunately, the crucial time element is an obstacle to reliability of performance.

Two products currently available have the potential for seedhead suppression or selective suppression of annual grass growth. One of these is Embark, a compound that provides good prolonged growth inhibition. It also gives excellent seedhead suppression of *Poa annua* without severe inhibition of grass species in a stand of turf.

The other, and more recently available product, is marketed as Rubigan (EL222). It is a fungicide used for control of various turf diseases. In our early work with it we began to see that it inhibited *Poa annua* more than it inhibited the bluegrass. Further testing revealed that it will selectively suppress *Poa annua* and, over a period of time, with frequent use, it will tend to eliminate it in a stand of cool season grass. Rubigan, although it is not a seedhead inhibitor, has this special ability to influence *Poa annua*.

These two products represent to some degree where we stand today. We are not only considering growth regulators as a means of possibly reducing mowing frequency requirements and labor costs, but we are also seeing them as selective herbicides that will reduce the ability of one plant to grow where another remains aggressive, thus effecting a change in turf population. Not every compound fulfills both functions, but there is much promise in the concept of using them in combination with each other.

Seedhead suppression by growth regulators has added incentive to develop new compounds.

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