

PGRs FOR HIGHWAY TURF

The use of PGRs has led to the concept of 'chemical mowing,' the idea being that growth suppression will minimize or eliminate the mowing requirement.

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Vegetative and seedhead suppression of Kentucky bluegrass with Embark (left) compared to an unmowed check (right).

As state and local governments struggle with fiscal restraints, transportation departments are looking for ways to minimize highway maintenance costs.

Mowing highway rights-of-way is a multi-million-dollar-a-year cost—not including the private and government monies spent on mowing along power lines, airport divider strips and railroads. By eliminating or reducing the number of mowings, substantial savings in manpower and fuel costs could be achieved.

Some attempts, which have been successful on a limited scale, have been made to reduce mowing costs by turning highway rights-of-way into wildlife areas or landscaping the area with plant materials that do not require mowing. But due to safety factors, indirect costs or impracticability of these alternatives, the vast majority of highway rights-of-ways are still mowed.

The use of plant growth regulators

(PGRs), chemicals that retard plant growth, on turfgrass has led to the concept of "chemical mowing," the idea being that growth suppression will minimize or eliminate the requirement of mowing.

Because of the increase in the number of PGRs on the market and the publicity they get, are they a hot new item? In a lot of ways they are. However, PGRs in some form have been around for a number of years. One of their first uses was targeted to highway rights-of-way.

Growth regulators have not, in the past, received large scale acceptance because of certain limitations, although their use will undoubtedly grow.

An ideal PGR

Characteristics and performance of turfgrass growth regulators vary. Ideally, a turfgrass growth regulator should exhibit the following characteristics:

1. Reasonably long residual activity.
2. Inhibition of seedhead and stalk formation.
3. No objectionable discoloration or chemical burning of the turf.
4. Control or suppression of broadleaf weeds.
5. No reduction in turfgrass quality with repeated usage.
6. Low toxicity to desirable vegetation, and no long-term residual.

No growth regulator currently on the market possesses all of these traits. So the use of PGRs requires an understanding of the situation and the desired end result.

For example, highway rights-of-way turf quality can be lower than that required in a home lawn. Turf quality on a roadside, observed at 55 mph, is considerably different than the turf seen while standing on a home lawn.

A PGR for highway rights-of-way should provide relatively uniform vegetative suppression. This requirement is not as important as with a higher maintained turf, but enough that the turf appears uniform at 55 mph.

A lack of vegetative uniformity may necessitate mowing sooner than desired. PGR effectiveness on a wide spectrum of plants, including grasses and broadleaves, is critical to long-term maintenance of vegetative uniformity.

A PGR for highway turf should have low toxicity to the desired vegetation. Highway rights-of-way are low maintenance turf areas that undergo enough stresses through the year without having to deal with excessive chemical stress.

Excessive phytotoxicity in combination with repeat treatments can cause thinning of the turf.

A PGR for highway turf should have at least a five- to six week residual. If vegetative suppression is less than five weeks, the reduction in mowing num-

TABLE 1
Growth Regulators Available for Turf

Generic Name	Trade Name	Manufacturer	Vegetative Suppression	Seedhead Suppression	Root Absorbed	Foliar Absorbed	Broadleaf Weed Suppression	Restriction of Roots & Rhizomes	Phytotoxic ^a
Maleic Hydrazide	Several	Uniroyal Chemical	X	X			X	X	moderate-severe
Mefluidide	Embark	3M Corporation	X	X	Some		X	Some	low-moderate
Flurprimidol	Cutless	Elanco Corp.	X			X	X		low-moderate
Amidochlor	Limit	Monsanto Corporation	X	X	X				low-moderate
EPTC	Short-Stop	Stauffer Company	X	X	?			X	severe on fine turfs (recommended for tall fescue)

^aPhytotoxicity can depend on environmental conditions, plant health and cultural practices.

bers is not significant. On the other hand, season-long suppression would be undesirable because a plant needs to grow to rejuvenate itself.

An important characteristic for a highway PGR is the ability to suppress seedhead formation. Some grasses and weeds form extremely high seed stalks. If a PGR does not suppress the seed stalk, it defeats the whole purpose of the PGR. A mowing would have to be done to remove the seed stalk.

In low maintenance areas, such as highway turfs, broadleaf weeds are a component of the turf. Suppression or control of these weeds is an important consideration in using PGRs. A common practice is tank-mixing a PGR with a broadleaf weed killer such as 2,4-D, which can easily control weeds such as dandelion, dock, wild carrot, pigweed, plantain, and thistle.

Grass growth & development

Deciding on the "ideal" PGR for highway turf requires the user to understand the effect PGRs have on plant health.

Growth regulators, unfavorable environmental conditions, or other factors that retard tiller and leaf initiation and development can result in a reduced population of leaves and tillers, lower turf density, and, in turn, reduced grass quality.

A reduction in grass density will also favor the encroachment of un-

desirable weed species, further detracting from quality.

Lateral shoot growth and the development of new shoots from vegetative buds on rhizomes and stolons enhance the recuperative potential and rate of many grass species (e.g. Kentucky bluegrass and creeping bentgrass). Recuperative potential is especially important on grass sites

Suppression or control of weeds is an important consideration in using PGRs.

that are injured by traffic or other mechanical or biological factors.

Growth regulators inhibit the initiation and/or development of secondary lateral shoots. Interference in root initiation and development will obviously deter from the maintenance of high quality turf. Growth regulators have been shown to interfere, to some extent, with these normal root renewal processes.

Plant growth regulators

The current PGRs available for turfgrass use are listed in Table 1.

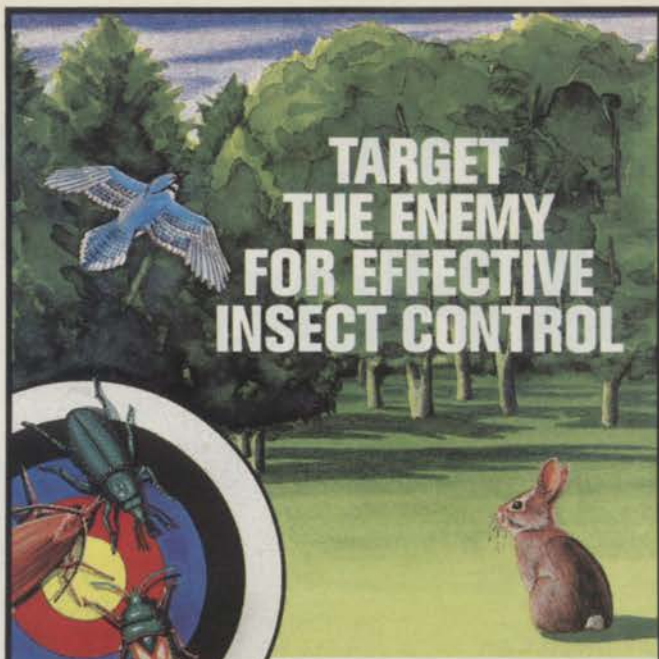
Maleic hydrazide was the first growth regulator available for turf,

and has been used in rights-of-ways in a number of locations. It suppresses turfgrass growth by inhibiting cell division in the shoots, roots, and buds of the turfgrass plant. Maleic hydrazide's broad activity in the root and bud areas has caused restricted root and rhizome growth of Kentucky bluegrass. Its use has been limited primarily to low maintenance areas because of possible phytotoxicity and excessive inhibition of plant growth under stress.

Mefluidide (Embark) is one of the newer plant growth regulators. Mefluidide suppresses vegetative growth and seedhead production, and inhibits cell division and meristematic activity in plant areas that contact this PGR. It is absorbed by the foliage, but is not as readily translocated in the plant as maleic hydrazide. This is a possible reason that root and rhizome suppression does not appear to occur with mefluidide.

Flurprimidol (Cutless) is also a new PGR that has good vegetative growth suppression and some weed suppression. Flurprimidol has been ineffective for seedhead suppression in some research studies. Its inability to consistently inhibit seedheads is a negative factor in highway rights-of-way situations. However, combinations of flurprimidol and mefluidide are alternatives where seedhead suppression is desired. Flurprimidol has shown some activity

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on poa annua suppression (control) in fine turf situations.

Amidochlor (Limit) is a root-absorbed PGR, thus requiring moisture within 3-5 days after application to wash it into the root zone. Amidochlor has shown both vegetative and seedhead suppression. No apparent root growth suppression has been associated with amidochlor.

EPTC (Short-Stop) is a new PGR that is recommended for use on tall fescue because it can cause phytotoxicity on finer turfs. Short-Stop does provide weed suppression characteristics since it is closely related to the pre-emergent herbicide Eptam.

PGR considerations

There are more PGRs to choose from

The slow growth rate of turfgrass plants treated with a PGR retards the recuperative potential of the plant.

then ever before. With the new PGRs and new experimentals being tested, the future looks promising.

One note of caution is to always analyze the situation in which you use the PGRs. A PGR may show differential activity for different grasses.

For example, tall fescue and perennial ryegrass are generally more difficult to suppress than Kentucky bluegrass. Plant growth regulators by their nature inhibit the renewal process of turfgrass plants. Renewal of leaves and tillers is a necessary process to sustain quality turf.

Plant growth regulators, unfavorable environmental conditions or any factor that reduces tiller and leaf initiation results in lower turf density. Lower density can favor weed encroachments, loss of turf/soil stability, erosion, excessive water runoff and other related problems.

Disease incidence has been more prevalent on turfgrasses treated with a PGR. The slow growth rate of turfgrass plants treated with a PGR retards the recuperative potential of the plant.

These factors are important in deciding if a PGR is right for a specific situation.

On highway rights-of-ways, turf quality is of less concern than other factors, but functionality (density) with regard to turf/soil stability and erosion are critical in deciding on a PGR along with repetitiveness of its use and site selectivity.

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