TECH CENTER

Plant growth regulators in turfgrass management

Some PGRs may cause discoloration of turf. The trade-off is in reduced labor costs. Spring fertilization can help improve color, but may also reduce PGR efficacy.

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■ The best plant growth regulator will reduce mowing requirements, improve turfgrass density, inhibit seedhead development, improve color and more.

The practical uses of turfgrass require that topgrowth be kept within specific heights, which may vary with the turf's purpose and function. So mowing management must take into account the detrimental effects upon the growth and long range health of the root system, as mowing reduces leaf area and the carbohydrate production necessary for adequate root growth.

A general rule-of-thumb in mowing management is "mow frequently enough so as to remove no more than one-third of the foliage at any one time."

Cool-season turfgrasses have a peak period of shoot growth associated with spring green-up. Applying readily-available nitrogen at this time can stimulate excessive shoot growth.

Fall fertilization tends to improve root growth and does not stimulate this spring flush of leaf growth with excessive carbohydrate use.

However, a slow-release fertilizer may be needed in spring and is more acceptable than soluble forms. Earlier spring green-up without lush peak growth occurs with fall fertilization.

Inhibitors and suppressors—Plant growth regulators (PGRs) are used to reduce excess shoot growth in spring while conserving energy in the crowns and roots of cool-season turfgrasses. After the initial effects, turfgrasses become darker green and generally contain high amounts of protein in the leaves.

Type I PGRs inhibit or suppress turfgrass growth. Inhibiting compounds are foliarly absorbed and require a period for uptake before irrigation or rainfall.

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Examples include maleic hydrazide (Slo-Gro) and mefluidide (Embark). These compounds inhibit cell division, meristem development and seedhead elongation.

Suppressor compounds are absorbed through crowns and roots. They work best with some rainfall or irrigation after application. Amidochlor (Limit) is root absorbed and requires rainfall or irrigation to achieve maximum suppression. The crown meristems appear to be the main site of action. Seedhead reduction will occur only if the product is applied before seedhead elongation. Root growth may continue while shoots are suppressed.

Inhibiting compounds reduce shoot growth within one week and are effective for 4 to 10 weeks. The number of mowings required are generally reduced during this time.

PGR injury symptoms may include foliar discoloration, reduced density and initially low quality, which appears to result from inadequate growth to replace senescing plant parts.

Spring fertilization, especially with nitrogen, may enhance the quality of turf through reduced injury. However, in many instances the PGR effectiveness is also reduced.

Turfgrass thinning caused by PGRs may also be reversed by nitrogen application at the time of treatment. Even though fall fertilization is preferred for cool-season turfgrasses to reduce the peak shoot growth in spring, the effectiveness of PGRs may also be reduced.

Weed control and PGRs—Turfgrass density is generally low after inhibitor PGRs have been applied, and turfgrass is prone to weed invasion.

Annual grasses such as crabgrass, foxtail and goosegrass are found to invade and become very competitive in the thin turfgrass. Broadleaf weeds are quick to emerge and/or spread into turfgrasses following inhibitor Type I PGRs. In many cases, management programs include weed control treatments along with the PGRs for maintenance of improved turfgrass quality.

Growth retardants—Growth retardants reduce the height of plants by inhibiting biosynthesis of gibberellins which regulate cell enlargement in plants. Growth retardants reduce the extent of cell elongation, resulting in the control of canopy height. They also inhibit subapical meristems rather than apical meristems as described for Type I PGRs.

Examples of Type II growth retardants currently in use in turfgrass management programs are flurprimidol (Cutless), paclobutrazol (Scotts Fertilizer with TGR) and trinexapac (Primo). These PGRs do not inhibit seedhead development to the extent obtained with Type 1 PGRs. Flurprimidol and paclobutrazol are absorbed by turfgrasses through roots and crowns while trinexapac is absorbed through the foliage. Biosynthesis of gibberellin is inhibited early in the synthesis cycle by flurprimidol and paclobutrazol and late in the cycle by trinexapac.

Although trinexapac is rapidly absorbed, there are some concerns about rainfall immediately after application.

Although not widely accepted, some research indicates that a small amount of mefluidide may be mixed with growth retardants to obtain improved seedhead control.

Stem height is reduced by Type II PGRs and seedheads of bluegrass and annual bluegrass may remain below the clipping height. In many cases, a trim-type mowing is used a week or so after application to improve quality by removing bluegrass and tall fescue seedheads.

The effects of Type I growth retardants can be reversed by gibberellic acid application. Nitrogen fertilization and gibberellic acid reverse the retardant effects and improve turfgrass quality and appearance. However, mowing is again required.

Increased tillering has generally improved the turfgrass density after using a growth retardant. Weed invasion is not as pronounced following the application of growth retardants. Growth retardants are used in golf course fairways to reduce mowing requirements, annual bluegrass encroachment and spring and summer color.

Basically, PGRs regulate turfgrass growth by inhibiting or suppressing cell division in apical meristems and crowns (Type I) and by interfering with gibberellin biosynthesis (Type II). Inhibitor PGRs reduce growth by interfering with cell division and reduced seedhead emergence.

After spring green-up, three sequential applications of trinexapac at four-week intervals resulted in the dark green Kentucky bluegrass fairway. Light green bluegrass was apparent beyond the treated area.

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