

PENN STATE TESTS REVEAL GROWTH REGULATOR PROS AND CONS

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Commercial and experimental growth retardants have been tested for seven years on different cool season turfgrasses at Penn State. The principal objective has been to reduce foliar growth without reducing aesthetic quality. Also, research has been conducted using growth retardants to control annual bluegrass (*Poa annua* L.) through seedhead inhibition and postemergence phytotoxicity to seedlings.

Retardation of fine turfgrasses

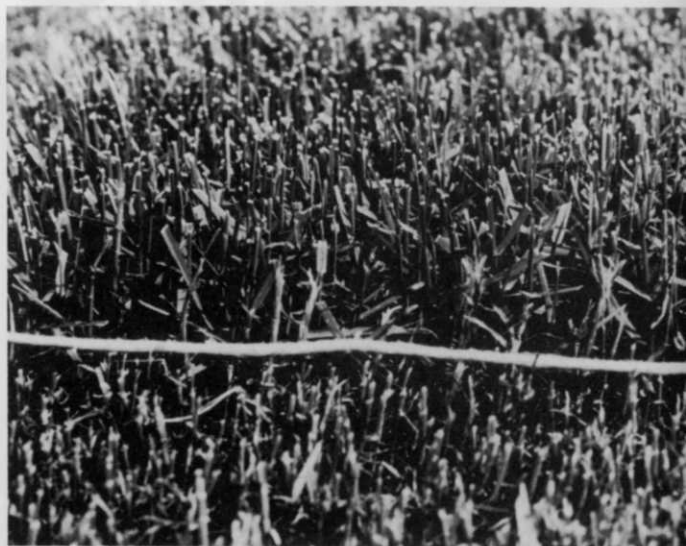
During the past seven years, Kentucky bluegrasses (*Poa pratensis* L.) and, in some years, tall fescue (*Festuca arundinacea* Schreb.) have been treated with several different growth retardants. Among those tested have been MH, Chlorflurenol (CF-125), MBR 6033 (Sustar), MBR 12325 (Embark), Endothal, C-19490, CGA-17020, CGA-24705, RO7-6145, EL-509, EL-72500, MBR 13387, DS-31247, DS-35245, and PP-333. Treatments have been applied as granular and liquid formulations (at 50-200 gallons of water per acre). Initial applications have been applied in late April or May with repeat applications applied four to six weeks later (depending on material).

Color ratings have traditionally been taken on a weekly basis following treatment. Yields have been taken weekly in some tests and at longer intervals in others. Height measurements have been taken at regular intervals on all tests. Seedhead suppression has been recorded when applicable and density measurements have been taken at the end of most tests. Carbohydrate levels were sampled twice monthly in one experiment in 1973.

Results of studies

Typically, all materials retarded top growth (more from higher rates than lower) for approximately four to six weeks. Duration and intensity of injury varied from chemical to chemical. Severe, long lasting injury has been the exception rather than the rule for most experimental materials. Initial studies used MH and Chlorflurenol as commercial standards, however, Embark has been used as a standard in recent years because it has become commercially available, causes less injury and more growth suppression than MH. Typically, tall fescue has been injured less than bluegrass by most materials. Duration of growth suppression for a particular chemical has been approximately the same for tall fescue and bluegrass.

Without exception, after the retardation effect has subsided, treated turf has tended to grow faster than untreated turf. This "flush" of growth usually lasted for two or three mowings. Reapplication of growth retardants has been attempted to maintain the turf in a suppressed state and reduce the growth flush. Reapplication rates have typically been one-half the initial rate to minimize injury



Some growth regulators make grass stemmy and leaf growth further above ground. Note grass in background mowed after treatment ended. Grass in foreground cut too low also has stemmy appearance. Photo courtesy J. A. Jagschitz, Virginia Polytechnic Institute.

(which is usually more severe during high temperatures). However, lowered reapplication rates have not retarded growth nearly as long as the initial treatment even though injury was reduced.

Soluble nitrogen fertilizer (urea) has also been applied to turf treated with growth retardants to reduce injury. It was found that injury was reduced, but the duration of retardation was shortened and the growth stimulation following growth suppression was increased.

Some slight decreases in bluegrass density have occurred due to treatment with growth retardants. This phenomenon has even been found the year following treatment in some cases. Tall fescue density has not been reduced as much as bluegrass.

Granular formulations of most materials tested have significantly reduced injury while maintaining four to six weeks activity. Recently, root absorption of granular experimental materials has allowed applications that do not require foliar absorption. The result has been less injury. Root absorption offers advantages and disadvantages. Obviously, reduced injury is an advantage, but another would be the potential for slow release formulations that could bring about season long growth suppression. A possible drawback would be the necessity for water to release the chemical. However, irrigation systems are typically available to supplement rainfall in most turf situations.

Increased disease susceptibility has been reported on grasses treated with growth-retardants. Dollar spot, leaf spot, and stripe smut are the three

diseases most frequently observed. Treated turf does not have the capability to mask disease blighted leaves with new growth. Recovery from severe disease attacks is also slower. Disease susceptibility has also been shown to carry over from one year to the next. This has been particularly true for leaf spot and stripe smut on bluegrasses. This phenomenon has only been observed when more than one application of a given growth regulator has been made the previous year. In the future, long residual or controlled release materials may have even more potential for increasing disease problems the following season. However, fungicides applied to turf that has been treated with growth retardants have reduced diseases to the same degree as fungicides on untreated turf.

Although considerable progress has been made, commercially available growth retardants should not be applied to turf that has a high aesthetic priority. For now, hazardous-to-mow, non-use, and trim areas have the greatest potential for growth retardant use. Areas where aesthetic quality is not at a premium also offer possible uses. In a test where Embark has been applied to tall fescue between the tree rows of a trellised apple orchard (where some discoloration can be tolerated), the number of mowings has been significantly reduced without detrimental effects to the apple trees. Three years of applications in this orchard did not

reduce the quality of the tall fescue stand. The future for growth retardants on fine turf is uncertain, but experimental materials currently under test have shown considerable promise. Long residual, non-injuring growth retardants may become available for turf before management programs are designed to incorporate their use.

With fossil fuel and water shortages already upon us and the prospects for the future being the same, reduced turf growth can contribute to the solution of both problems. Gas and oil dependent mowing equipment will be used less and water will be conserved because of a slower growth rate.

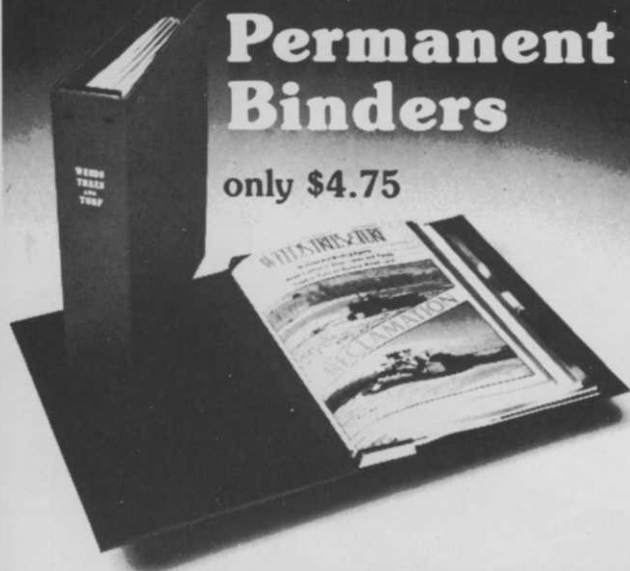
Growth retardants for annual bluegrass control

Before 1970, most annual bluegrass control work dealt with determining the proper proportions of the growth retardants, chlorflurenol and maleic hydrazide (MH) to inhibit seedheads. By 1973 it was concluded that chlorflurenol (0.5 lb/A plus MH at 1.0 lbs/A) was sufficient to suppress seedheads. Multiple spring applications resulted in better seedhead inhibition than single treatments and the inhibition lasted longer. Repeat applications were made at one half the initial rate to reduce injury.

Soil under turf treated with chlorflurenol + MH was found to have a significantly reduced amount

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of seed shattered onto the soil, but the amount of seed found was still sufficient to allow the stand to be self-perpetuating. In addition, these growth retardants were not found to significantly effect the viability of the seed produced by treated plants.

Fall application

In 1971, late September applications of chlorflurenol (0.5 lb/A) plus MH (1.0 lb/A) produced encouraging results. A significant number of annual bluegrass seedlings were controlled and, with the onset of cold weather, there was a reduction of mature annual bluegrass. During winter, the treated turf was severely discolored, but, the following spring the desired species had a normal "green-up". There was also a significant decrease in seedhead production by the surviving annual bluegrass. Spray dilutions of 70 gallons/acre were necessary to insure adequate distribution of the chemicals to the seedlings, because many were under the mature leaf canopy.

When annual bluegrass comprised 30% of the turf population or less, overseeding was not necessary. Voids were rapidly filled in by the desired species or sometimes by germinating annual bluegrass. When more than 30% of the stand was an-

nual bluegrass, overseeding after treatment worked best. Chlorflurenol and MH have no preemergence properties, therefore a delay before overseeding was unnecessary. Due to the lateness of chemical treatment (late September or early October), spring overseeding should be considered, particularly when Kentucky bluegrass is used. A groover-type seeder should be used to insure good seed to soil contact regardless of overseeding time or species.

Recently, MH applied alone in the fall (1.5 lbs/A) has controlled annual bluegrass nearly the same as when combined with chlorflurenol. In tests with chlorflurenol, MH alone controlled annual bluegrass about the same as the combination, while chlorflurenol alone was not effective. The advantage of the combination appeared to be in the knotweed and clover control that resulted. MH alone did not provide good broadleaf weed control.

In experiments on bentgrass-annual bluegrass fairways, MH (1.5 lbs/A) has controlled annual bluegrass significantly. Discoloration of bentgrass was more severe than on Kentucky bluegrass during the winter months and spring "green-up" was a little slower. When the percentage of annual bluegrass in bentgrass fairways was high, a two directional overseeding, (bentgrass one way and

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ryegrass the other) has been used successfully. The ryegrass germinated quickly and competed with annual bluegrass but did not compete with the bentgrass once the bentgrass matured. Research to date has indicated that the conversion of a bentgrass-annual bluegrass stand to predominately bentgrass is a more gradual process than converting a Kentucky bluegrass-annual bluegrass mixture to predominately Kentucky bluegrass.

Three consecutive fall applications (usually with overseeding) appear necessary for significant annual bluegrass control. After three years, it must be decided whether to continue application or initiate a preemergence program. Application of preemergence materials, may preclude further fall overseeding and for all practical purposes eliminate fall aerification programs.

Are there drawbacks?

Although the cost of applying MH at 1.5 lbs/A can be justified, this type of annual bluegrass control program requires excellent communication with club officials. Due to the discoloration associated with application of MH (even though it occurs in late fall and winter), it is important that those using the golf course be informed.

Spray equipment must be **precisely calibrated** and functioning properly (new nozzles, proper overlap, etc.). Sloppy applications of MH will be very obvious, particularly when severe discoloration occurs with colder weather.

Fall application of MH on turf-type perennial ryegrasses has caused stand losses over the winter. Therefore, caution should be exercised when treating areas that have been overseeded with perennial ryegrasses.

Initially, use of MH for annual bluegrass control should be tried on a limited scale in combination with overseeding. Observation of the treated area will assist the superintendent in determining the amount of discoloration at his location and the amount of control. Also, any sprayer problems can be identified and corrected before expanding the program. Several golf course superintendents have initiated annual bluegrass control programs with fall applied MH and in almost all cases, they have increased the use of the program. **WTT**



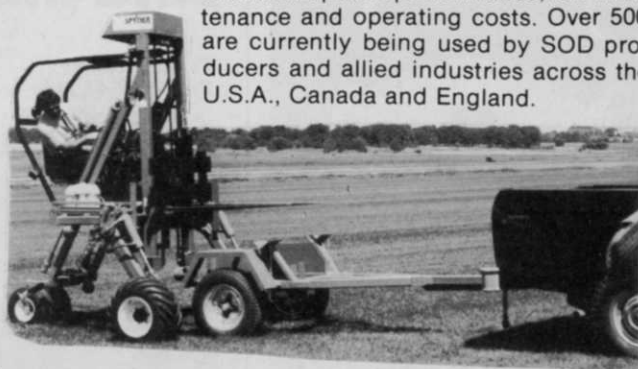
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