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PENN STATE TESTS REVEAL GROWTH REGULATOR PROS AND CONS

by Thomas L. Watschke, Associate Professor of Turfgrass Science, The Pennsylvania State University

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

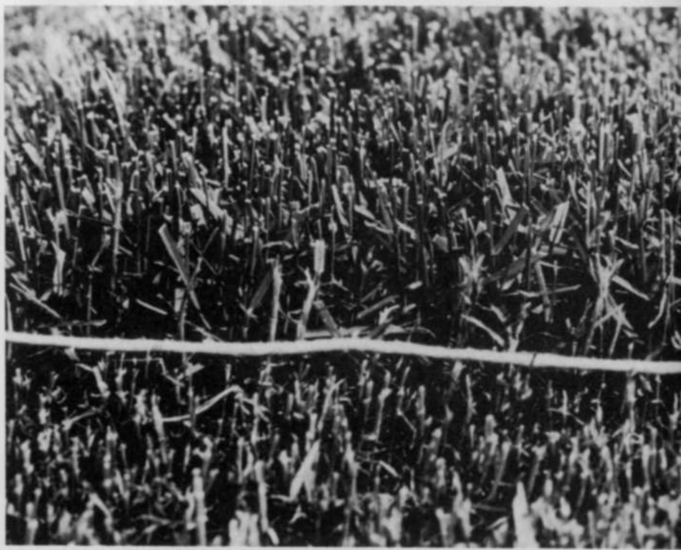
During the past seven years, Kentucky bluegrasses *(Poa pratensis* L.) and, in some years, tall fescue *(Festuca arundinacea* Schreb.) have been treated with several different growth retardants. Among those tested have been MH, Chlorflurenol (CF-125), MBR 6033 (Sustar), MBR 12325 (Embark), Endothal, 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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"I could sure use a
rugged mid-sized rotary
that really maneuvers."
JACOBSEN

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 annual 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

Continues on page 54

Sure, there's more to maintaining quality, disease-free turfgrass than a couple of fertilizer applications. But turfgrass scientists across the country are reporting that a fall application of IBDU (31-0-0) can produce turfgrass with better root development and less disease problems.

Dormant turfgrass plants continue to produce rhizomes and roots, even though vertical growth has stopped. During this time nitrogen should be made available to the turfgrass plant as carbohydrates are naturally accumulating. Thus, scientists say, the optimum timing for nitrogen applications is during the fall and early winter months.

IBDU (31-0-0) is ideally suited for dormant nitrogen fertilization. Because of it's slow release characteristics based on hydrolysis, IBDU releases nitrogen later in the fall and earlier in the spring promoting better rhizome and root growth. A fall fertilizer program using IBDU should produce healthier more vigorous turfgrass plants and reduce the severity of several turfgrass diseases.

Remember. Healthy turf next spring starts with IBDU this fall.

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RINGS AND PISTONS INDICATE ENGINE MAINTENANCE NEEDS

By Paul Scholten, Service Manager, Kohler Co.

In the July issue, we talked about analyzing the air intake system, oil, carburetor, and valves as you tear down your four-cycle engines. By carefully noting what you find, you can better understand what steps you must take to prevent engine problems in the future.

Now we come to the rings and the pistons. Here you should remember that almost all ring and piston failures are related to either excessive wear or seizure.

If during teardown you find that a piston has cracked, check for wear patterns on the side of the piston, excessive wear on the rings, and wear patterns in the cylinder bore. Such wear can cause piston slap which leads to cracking in the piston skirt.

In some instances, wear may be caused by dirt that entered through the air intake or by a build-up of carbon. You can tell this by examining the top ring and the area above it. If the top ring and the area above it are excessively worn but there are signs of decreasing wear on down to the oil ring it is likely that dirt or carbon contamination was the culprit.

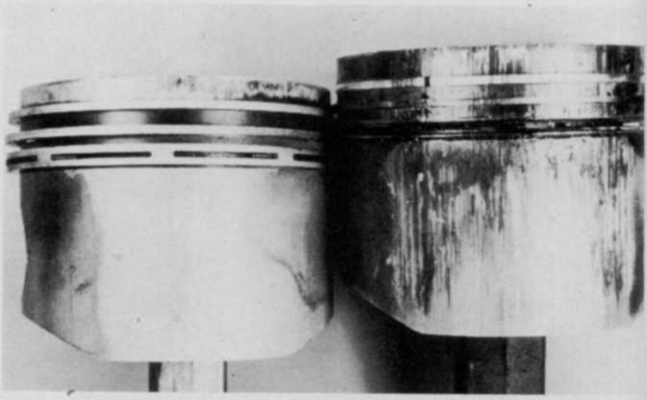
Piston seizure is most commonly caused by overheating resulting from a lack of cooling air. It can also be caused by poor lubrication, oil additives, foreign matter in the oil, and gum deposits from stale gasoline. Since all of the causes leave similar types of damage, it is very difficult to single out the culprit by examining the affected parts. But, if you have carefully noted the condition of the oil and cooling system when you began the teardown, you can probably figure out the cause of the seizure.

It used to be assumed that the discoloration of a rod indicated a failure caused by lack of lubrication. Recent studies show, however, that such discoloration may have many causes.

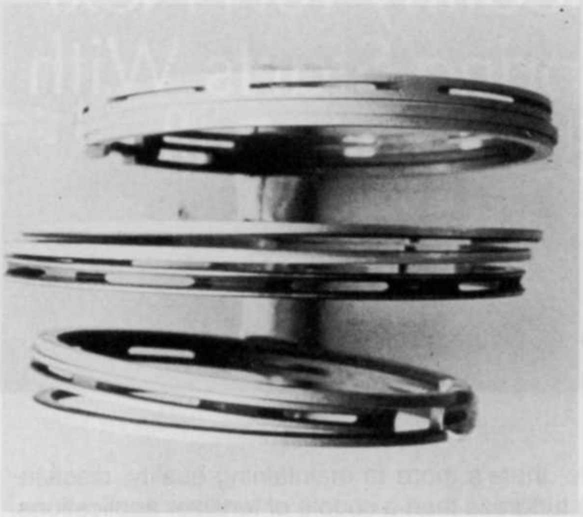
You can analyze a rod failure by checking four areas. First, inspect the dipper. Has it been broken off? Note its color compared to the rest of the rod. If there is a color difference between the top of the rod and the bottom it indicates that there was oil in the crankcase. If the dipper is broken and the color on both sides of the break is the same, that would indicate that the break occurred after the seizure. If the rod is the same color from one end to the other, it indicates that there was no cooling and that the entire rod ran extremely hot.

If the dipper is missing, check the surface of the break for clues to the cause of the breakage. Burned oil on the break surface indicates that the dipper broke before the seizure. An oil-free break tells you that the break occurred after the seizure.

Next examine the rod bearing surfaces. Look for the presence of deposits as indicators of specific conditions. For example, carbonized oil deposits on the bearing surface show that there was oil present so a lack of oil is unlikely to be the cause of the engine failure. If no such deposits exist, there was no oil present when the failure occurred and that has to be considered as a possible cause of the engine trouble. Partial scoring of the surface of the bearing shows that there was an incorrect fit between the rod and the crankshaft.



Pistons show excessive wear (left) and seizure (right). Wear can be a result of dirt coming in the air intake or carbon buildup. Seizure is usually caused by inadequate colling or poor lubrication.



Oil rings tend to wear faster and get wider as wear takes place.

The third area to be examined is the surface between the cap and the rod. Improper fit here is usually the result of incorrect tightening or incorrect torque. You should be able to see signs of this on the mating surfaces as well as on the rod bolts.

Rough mating surfaces may prevent correct fit between the rod and the crankshaft even though proper torque is applied. That will cause an un-

Continues on page 47

Jack of all trades–master of most

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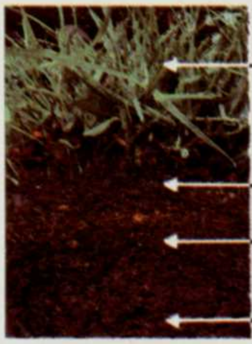
BEFORE

At time live soil bacterial spores were applied — note the accumulation of compacted Mat & Thatch at the surface. Heavy thatch sheds water, harbors insects and disease, and prevents deep root growth.

HOW THE PROCESS WORKS



NOTE: Decomposition progresses from the top surface of mat & thatch downward into the soil because the microorganisms have been applied to the surface. Approximately 6 billion microbes are applied to 1,000 sq. ft. of lawn. Under ideal conditions they will double their numbers every 20 minutes.

AFTER

15 weeks later — same lawn — note that the Mat & Thatch has almost completely disappeared, roots are deeper, and the soil is looser and in better physical condition due to bacterial decomposition.

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Now, for the first time, a complete, natural product is available that contains natural organisms along with a completely balanced diet that will:

1. Naturally decompose mat & thatch up to ¾" within 9 to 12 weeks
2. Create more ideal conditions for the natural soil organisms to grow and multiply so they can continue their decomposition of Organic Matter, and at the same time, build up the productive capacity of the soil.
3. Reduces the stress conditions that produce insects and diseases, and provides a complete, balanced diet for the natural growth of desirable turf.
4. Reduces the need for: Frequent fertilizing
   Frequent watering
   Frequent applications of pesticides (fungicides & insecticides)
5. Eliminates the need for: Power Raking
   Frequent reseeding & resodding
6. Loosens, aerifys and builds more productive soil naturally, along with beautiful, healthy plants.

All you need to do is to mix the ingredient into your power spray rig, spray uniformly over your lawn — one application this season will decompose ½" to ¾" of Mat & Thatch, when used as directed.

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☐ I am not interested in becoming a dealer, but I am interested in applying MICRO-MUNCH to my own grounds.

My turf is ________sq. ft. or ________ acres

The mat thatch is ________________ inches deep

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Company ______________________

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City ______________________

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