CORNELL UNIVERSITY TURFGRASS TIMES

CUTT

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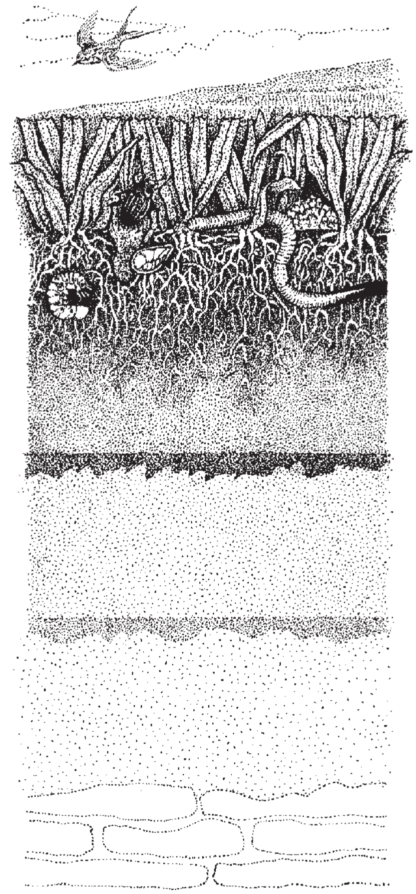

Maximizing Fungicide Performance

The use of fungicides is perhaps the most common method of turfgrass disease control. Despite the familiarity of fungicides to nearly all turfgrass managers, surprisingly few applicators are aware of the many factors that influence the performance of fungicides. It is generally believed that, if a fungicide is applied, it will control the disease. If it doesn't, then it is a problem with the fungicide or it is the wrong target disease. In this article, we will explore some of the factors that should be considered when applying fungicides in order to maximize their effectiveness. ■

Application

First, let's begin with application equipment and application techniques. Studies performed nearly a decade ago revealed that fewer than 25% of spray applicators were actually applying what they thought they were. Nearly all were making mistakes in mixing, loading, equipment configuration, and calibration of delivery rates. National losses due to these mistakes have been estimated to be in the billions of dollars.

It is important, therefore, that equipment be routinely and properly calibrated and maintained. This includes cleaning or replacing nozzles and checking nozzle pressure. Flat fan and swirl chamber nozzles often perform the best at pressures of 30-60 psi. Other equipment parameters to check on a routine basis include nozzle spacing, boom height, spray output per time per unit area, and spray coverage to avoid skips and overlaps.

Tank storage time and pH can also affect the efficacy of fungicides. Studies have shown that under alkaline (high pH) conditions, a number of commonly-used fungicides can break down and lose their effectiveness. For example, anilazine (Dyrene) is unstable at high pH values. Even at low pH levels, Dyrene stored in the tank for more than 20 hours will have reduced effectiveness. Fenarimol (Rubigan), on the other hand, is unstable at acid pH values when stored for 24 hours or more. Fungicides such as iprodione (Chipco 26019), vinclozolin (Vorlan), propiconazole (Banner), and triadimefon (Bayleton) are relatively insensitive to pH.

With the recent move toward IPM programs for turfgrass management, application timing is extremely critical. Things to consider with regard to application timing are the time of day, wind conditions, frequency relative to other pesticide applications or management inputs, and whether applications should be made preventively or curatively.

Fungicide placement is one of the more important factors affecting fungicide performance.

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This Times

Fall Weed Control

There are good reasons to think about weed control in the fall for turf and landscape areas. Weed species with a winter annual life cycle will begin to germinate in the late summer and continue to germinate through mid-October. Species such as annual bluegrass, corn speedwell and common chickweed will grow vegetatively in the autumn and will often be inconspicuous in lawns. In early spring, as the temperature begins to rise, they produce flowers, set seed and begin to die. This process can continue well into June. As the winter annuals are completing their life cycle in the spring, their yellowish appearance makes them unattractive in turf and in the landscape. Their presence can also create bare areas in the lawn which provide ideal areas for summer annual weeds to germinate.

The optimal timing for applying pre-emergence herbicides to control winter annuals is prior to germination—early August through mid-September. Irrigation or rainfall should occur within 3 to 7 days in order to move the chemical into the seed germination zone. Because of the long period of germination, winter annual weeds are often more difficult to control than other annual weeds.

The optimal timing for applying pre-emergence herbicides to control winter annuals is prior to germination—early August through mid-September.

Table 1. Herbicides for Fall Weed Control

Winter Annual	Pre-emergence Control (one of the following)
Annual Bluegrass	*turf & landscape*
	DCPA-DACTHAL
	pendimethalin-HALTS, Pre-M, others
	oxadiazon-RONSTAR
	bensulide-BETASAN, many others
	turf only
	benefin+trifluralin-TEAM
	benefin-BALAN
	landscape only
	trifluralin-TREFLAN
	oryzalin-SURFLAN
	napropamide-DEVRINOL
	metolachlor-PENNANT
Corn Speedwell (Veronica arvensis)	*turf & landscape*
	oxadiazon-RONSTAR
Common Chickweed	*turf & landscape*
	DCPA-DACTHAL
	pendimethalin-HALTS, Pre-M, others
	turf only
	benefin+trifluralin-TEAM
	landscape only
	trifluralin-TREFLAN
	oryzalin-SURFLAN
	napropamide-DEVRINOL
	simazine-PRINCEP

In bare areas of turf that are to be reseeded, fall applications of most pre-emergence herbicides should be avoided. Siduron (TUPERSAN) can be applied pre-emergence or on small seedlings of Kentucky bluegrass of fescue to control most annual grass weeds. Unfortunately, annual bluegrass is not controlled. Ethofumesate (PROGRASS) can be applied to newly planted perennial ryegrass or established Kentucky bluegrass. Common chickweed and annual bluegrass should be controlled.

Perennial Weeds

The fall is also the best time of year for controlling many perennial weeds in turf and in landscaped areas. At this time, the plants are translocating carbohydrates manufactured in the leaves into the roots and rhizomes. Systemic herbicides applied at this time are readily carried downward into these organs, allowing for more complete control.

Usually there will be less volatility of the hormone type herbicides, such as 2,4-D, Trimec or Turflon D when they are applied in cool weather. Ester formulations, which are often more effective on hard-to-control weeds can be more safely applied during this time of year. These post-emergence herbicides should always be applied in calm weather to avoid drift to non-target plants.

September is a good time to clean up invasive perennial broadleaf weeds such as mugwort, field bindweed and Canada thistle and Japanese knotweed in ornamental areas. Spot spraying with a non-selective systemic herbicide such as glyphosate (ROUNDUP) will help greatly in controlling these weeds for next season. In order for ROUNDUP to penetrate and translocate to the roots of these perennial weeds, the leaves must be green and fairly healthy and the plants must be actively growing. ROUNDUP will not be very effective if the air temperature is below 50˚F.

Inventory Your Weeds!

The fall is the best time to evaluate you current weed control practices, determine which weeds are escaping and plan a strategy for next year. Remember that the best and least expensive weed control in turf is a healthy vigorous sod which will prevent most weed seeds from establishing. Proper fertility, pH, aeration, insect and disease control are all aspects of good turf management that are essential for good weed control.

ANDREW SENESAC,
LONG ISLAND HORTICULTURAL RESEARCH LABORATORY

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Editor-in-Chief: Norman W. Hummel, Jr.
Masthead Illustration: Benn Nadelman
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Scanning the Journals

A review of current journal articles

Perennial Subspecies of *Poa annua* Complicates Control

If you're having more trouble controlling annual bluegrass lately, perhaps its because you have a resistant perennial subspecies mixing with the annual type. After decades of research, *Poa annua* remains the most troublesome annual grass weed in bentgrass greens. While pre-emergence herbicides generally give good control, poor results have also been seen. Earlier workers discovered that a resistant perennial subspecies of *Poa annua* was often the culprit in cases of poor control.

Several dozen annual and more than a dozen perennial subspecies of *Poa annua* have been described. Both subspecies occur extensively throughout the U.S. Unfortunately, the resistant perennial species is a prostrate, creeping type ideally suited to the growing conditions provided on heavily irrigated and closely mown greens. Both perennial and the annual subspecies also thrive in higher cut situations.

The annual subspecies of *Poa annua* is an erect, compact, and dense bunch-type grass, with many primary but few secondary tillers. Panicles are open, abundant, and densely seeded. The perennial type is prostrate, with numerous secondary tillers, fewer seeds, and is more heat and stress tolerant than the annual subspecies.

Researchers at the University of Tennessee Agricultural Experiment station, Knoxville, conducted trials to determine the relative susceptibly of both types of *Poa annua* to bensulide, while monitoring for any injurious effects of the herbicide to bentgrass. The research was conducted on a Penncross research green, similar in construction to USGA standards. Eleven different treatments were used over a period of 4 years, targeting strips of the annual and perennial subspecies seeded and sodded into the green. Timing of applications was found to be more important than rate of material applied, as poorest results were obtained when applications were delayed beyond seed germination. Good control (97%) of the annual subspecies was achieved in the most successful treatment after 4 years, but only 18% of the perennial subspecies was ever controlled. Maximum damage to the bentgrass was 3-5% in year 4. However, the researchers caution that higher bentgrass sod loss might occur on greens with heavier or native soils.

(From: L.M. Callahan and E.R. McDonald, 1992. Effectiveness of Bensulide in Controlling Two Annual Bluegrass (Poa annua) *Subspecies. Weed Technology 6:97-103.)*

Timing of applications was found to be more important than rate of material applied, as poorest results were obtained when applications were delayed beyond seed germination.

Cornell Cooperative Extension's Turfgrass Management Short Course

Since the first Cornell Turfgrass Management Short Course was held in January of 1986 more than 400 professional turfgrass managers from New York, New Jersey, Connecticut, Delaware, Pennsylvania, Maine, Massachusetts, Vermont, California, Wisconsin, Colorado, Canada, and France have graduated. Forty instructors and assistants from Cornell University, the SUNY Agricultural and Technical Colleges and the turfgrass industry are involved in teaching the lectures and laboratories. Class enrollment is limited so that laboratory sessions can maximize hands-on experiences.

The 2-week long Short Course includes 72 teaching hours, covering the principles of turfgrass establishment and maintenance. Topics include grass morphology, identification and selection, soil science, drainage, irrigation, fertilization, cultivation, renovation, and pest management topics (including identification and control strategies for insects, diseases and weeds). Other topics that help develop turfgrass professionals include the selection, establishment and maintenance of ornamentals; developing budgets, communication skills, customer relations, and motivation in management; and turfgrass management strategies. Daily student evaluations are collected and summarized to help improve subsequent Short Courses. A pass/fail final exam is given at the end of the course to assess achievement of the course's educational goals from both the instructor's perspective as well as from the student's perspective.

The Cornell Turfgrass Science Program promotes continuing education and maintains contact with graduates throughout the year at regional and statewide Cooperative Extension- and industry-sponsored educational programs and conferences.

One Short Course participant spoke for all by saying, "The Cornell Short Course experience has made a positive impact on my job performance and in my career as turfgrass manager."

For more details contact Joann Gruttadaurio, Short Course Coordinator, at (607) 255-1792. **Mark your calendar today: the Eighth Annual Turfgrass Management Short Course will be held January 4-8 and 11-15, 1993.**

Fungicide Performance

continued from cover

Studies have shown that under alkaline (high pH) conditions, a number of commonly-used fungicides can break down and lose their effectiveness.

The placement of the fungicide is largely dependent on the nature of the disease to be controlled and on some of the inherent properties of the fungicide being used. For example, if the disease to be controlled is caused by a pathogen that infects and survives in the foliage, placement of the fungicide is generally no problem. The fungicide can simply be applied as a spray.

The delivery of fungicides to the root zone to control root and crown diseases can be more problematic than for foliar diseases. Some properties of a fungicide may prevent it from coming in contact with the target pathogen, including: water solubility, systemicity (i.e. their ability to be absorbed and translocated throughout the plant), formulation, dilution, compatibilities, and the nature of the active molecule. Fungicides vary widely in their water solubilities. The water solubilities (expressed as ppm) of various fungicides are listed in Table 1. Generally, the more water soluble the fungicide, the greater its potential for being effectively drenched into the root zone.

Table 1. Water Solubility of Some Common Turfgrass Fungicides

Fungicide	ppm in water	Fungicide	ppm in water
Dyrene	Insoluble	Bayleton	20
Fore	Insoluble	Koban	25
Tersan 1991	Insoluble	Thiram	30
Daconil	<1	PCNB	87
Vorlan	3	Banner	110
Terreneb SP	8	Subdue	7,400
Fungo	9	Aliette	120,000
Chipco 26019	13	Banol	700,000
Rubigan	14		

Studies performed nearly a decade ago revealed that fewer than 25% of spray applicators were actually applying what they thought they were. Nearly all were making mistakes in mixing, loading, equipment configuration, and calibration of delivery rates. National losses due to these mistakes have been estimated to be in the billions of dollars.

Contact or Systemic Fungicides

Fungicides used for turfgrass disease control can be categorized as contacts and systemics. Many of the older fungicides are contact fungicides, including anilazine (Dyrene), chlorothalonil (Daconil 2787), etridiazole (Koban, Terrazole), mancozebore), quintozene (Turfcide, Terraclor), and thiram (Spotrete, Thiramad). Contact fungicides are typically applied to foliage to prevent pathogenic fungi from infecting leaves. When allowed to dry on the leaves, contact fungicides provide short term protection from foliar diseases. If, on the other hand, they are to be used to control pathogen activity in thatch or in the root zone, they can be watered-in.

Most fungicides used for turfgrass disease control are systemic fungicides. This means that they are absorbed by the plant where they can move in the plant vascular system from the original site of application to other distant plant parts. Most of the currently used systemic fungicides are translocated upward in the plant. A few have downward movement as well. Some of the commonly-used systemic fungicides include benomyl (Tersan 1991), iprodione (Chipco 26019), vinclozolin (Vorlan), propiconazole (Banner), fenarimol (Rubigan), triadimefon (Bayleton), metalaxyl (Subdue), propamocarb (Banol), fosetyl Al (Aliette).

The way in which systemic fungicides move in the plant influences the manner in which they should be applied. In general, foliar disease control with systemic fungicides is more prolonged when they are drenched into the root zone. Drenching upward-moving systemic fungicides into the root zone provides a much longer period of protection as well as control against some root and crown diseases. Root disease control with these fungicides (e.g. Subdue) is only possible if they are drenched into the root zone whereas downward-moving systemic fungicides (e.g. Aliette) can provide control of root diseases when applied as a foliar spray.

Systemic fungicides have the advantage over contact fungicides in that they 1) have longer residual action, 2) can protect root and crown tissues, 3) can eradicate pathogens that have already infected plant tissues, and 4) can protect newly-formed plant tissues. Many systemics have some contact activity as well.

There are some disadvantages to the use of systemic fungicides. Nearly all of the systemic fungicides do not actually kill pathogenic fungi but simply suppress pathogen activity. This is usually accomplished through a very specific mode of action. Repeated application of one or more fungicides with the same mode of action greatly enhances the opportunity for pathogens to develop resistance to these fungicides. Once resistance to a particular fungicide develops, that fungicide is no longer effective. Therefore, one particular fungicide should never be used repeatedly over prolonged periods of time.

Minimize the development of fungicide resistance by 1) alternating fungicides with different modes of action, 2) using fungicides with different modes of action in mixtures, or 3) alternating or mixing systemic fungicides with contact fungicides to give the desired disease control.

Compatability

When mixing fungicides and other chemical inputs, their compatibility can affect their efficacy. In some cases, synergistic combinations have been identified. These include combinations of sterol inhibiting systemic fungicides and chlorothalonil for the control of a number of turfgrass pathogens, combinations of metalaxyl/ mancozeb, chloroneb/thiram, and etridiazole/ PCNB for the control of Pythium diseases, and anilazine/Zn (or Cu) for the control of anthracnose. In many cases, however, combinations of fungicides can be detrimental to their efficacy. Don't mix anything that will lead to a highly alkaline or highly acid condition. Don't use adjuvants unless you know they are safe. If you are unsure of the phytotoxicity of the mixture, perform a test on a small area before mixing on a large scale. Finally, do not mix materials targeted for both foliar and root problems unless they are either both contacts or both upwardly-moving systemic fungicides. Otherwise less than optimal control will result for one of the diseases in the complex. Better yet, use one of the many fungicide combination products now on the market.

Environmental Parameters

The final group of parameters affecting fungicide performance are the environmental parameters. These include plant, soil, atmospheric, and pathogen factors. One of the first things to consider is the growth of the plants, since this will influence not only its overall vigor and natural resistance to pathogen attack, but will also affect the uptake of systemic fungicides. Generally, the more rapid the plant growth, the more readily systemic fungicides will be absorbed and translocated. Systemic fungicides should never be applied to dormant turf.

Temperature, moisture, and pH can affect the efficacy of fungicide applications. Temperature can indirectly affect the pathogen and the plant, but can also directly affect the volatility of some fungicides such as Bayleton and Banner. These fungicides are generally more effective at warm temperatures.

Moisture can also indirectly affect the pathogen and the plant, but can directly affect the movement of fungicides in soil and on plant surfaces. As stated before, contacts need to dry on the plant surface to be active whereas systemics can be watered in but not leached away.

Soil properties such as pH, soil type and thatch may also affect fungicide performance. Keep the soil pH in a range between 6 and 7 and thatch to a minimum thickness to maximize performance of the fungicide.

Life Cycle

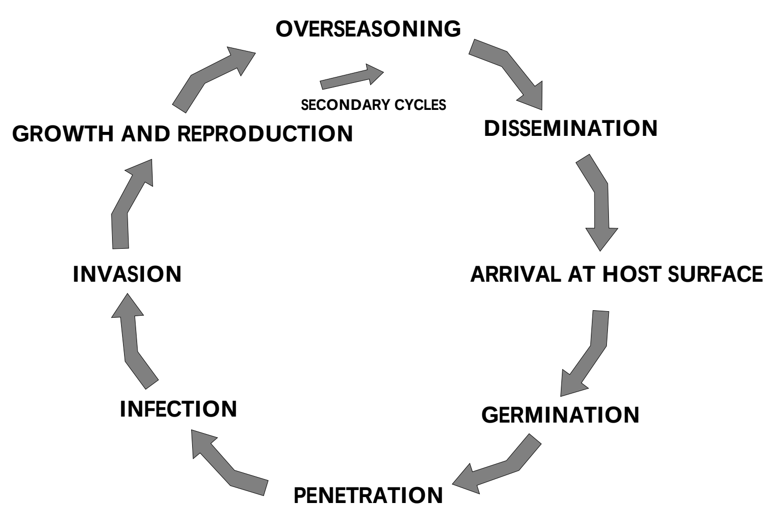
Fungal pathogens of turfgrasses exhibit developmental processes that are very cyclic in nature. Likewise, their interactions with plants are also very cyclic. Plant pathogens follow distinct stages of this developmental process, as shown in Figure 1. Spores or other propagules of the pathogen are disseminated to susceptible plants upon which the spores germinate. After germination, the pathogen will penetrate the plant and establish an infection. Following the growth of the pathogen through the plant tissues, a new "crop" of spores are produced.

At some point in the life cycle, fungal pathogens become dormant. This dormant phase allows the fungus to survive adverse conditions. For most pathogens, the dormant stage occurs during the winter months. However, for some pathogens (e.g. *Typhula* spp.), the dormant stage occurs during the summer months. During this dormant stage, the pathogen is generally resistant to most fungicides, particularly systemic fungicides. Only a few contact fungicides will actually destroy dormant pathogen propagules.

The germination of fungal spores is a particularly sensitive stage in the life cycle. Most fungicides are capable of inhibiting spore germination as well as spore production and other stages of the life cycle. However, some fungicides only inhibit spore germination but not spore production (e.g. iprodione) and may not be as effective against some pathogens under certain environmental conditions as other fungicides.

Systemic fungicides have the advantage over contact fungicides in that they 1) have longer residual action, 2) can protect root and crown tissues, 3) can eradicate pathogens that have already infected plant tissues, and 4) can protect newly-formed plant tissues.

Figure 1. A Generalized Turfgrass Disease Cycle



In summary, I have tried to briefly outline a number of factors that should be considered when using fungicides for the control of turfgrass diseases. Incorporating these suggestions into your turf disease control program should help to maximize the performance of fungicide applications. An awareness of the many elements affecting the performance of fungicides will, at the very least, aid in the selection of the appropriate material, application techniques, and use for particular sites.

ERIC B. NELSON,
DEPT. OF PLANT PATHOLOGY

Establishing Turfgrasses by Seed

When selecting the grass species and cultivars try to balance the conditions of the site against the expected use. Consider the intensity of use, the desired quality, and the potential pest problems in view the physical limitations of the site.

Almost every new seeding will have some level of weed infestation. Many of the weeds that germinate in new plantings will not tolerate mowing and will be easily controlled after mowing starts.

Late summer through early fall is the preferred period for turfgrass establishment in New York. Warm soils, cooling temperatures and the autumn rains all coincide to produce a desirable environment for seed germination and seedling growth. So with some planning and a bit of attention to detail planting turfgrasses in the late summer can be very successful. Taking care to ensure a dense vigorous turf from the beginning will result in greater utility and lower maintenance costs for many years. The following is a checklist of the steps involved in successful turfgrass establishment.

Site Analysis

A few weeks prior to seeding ask yourself some questions about the site. How good is the soil drainage? Will the area need to be provided with surface or subsurface drainage or will the site be droughty. How is the site sloped? If major grading is required, strip the topsoil, grade the subsoil then replace the topsoil uniformly over the area. How much topsoil is on the sight and does it need to be amended? The topsoil layer should be at least 6" thick, preferably 8–12" thick. What is the nutrient status of the soil? Soil testing should be one of the priorities when conducting a site analysis. Adjustments to soil acidity, soil potassium and soil phosphorus levels can easily be made prior to planting. What is the physical condition of the soil? Adding an organic amendment to very sandy soils or to heavy clay soils can improve their physical condition. If the area to be seeded is either an athletic field or golf green consider physical testing of the proposed root zone mix in addition to a nutrient test. Finally, are there any perennial weeds, especially perennial grasses, on the site and how can they best be controlled before seeding? Glyphosate (Roundup) has no residual activity and it is safe to proceed with establishment a week after treating an area with glyphosate. Remember that seeding will have to be postponed about 16 weeks after the application of most preemergent herbicides and 4 weeks after the application of most postemergent herbicides.

Seedbed Preparation

Once the site is cleared, cleaned of debris, and graded the seedbed can be prepared. Seedbed preparation includes adjusting the soil acidity and nutrient levels and the final grading. If soil test results are available follow the test recommendations, provided not more than 2 lb K_2O is applied to the seedbed. Work the materials into the top 6" of soil. If no test results are available fertilize with 0.5 lb P_2O_5 /1,000 square feet and with 0.5 lb K_2O/1,000 square feet.

The purpose of the final grading is to create a firm and even seedbed. A roller can be used to firm the seedbed and to reveal uneven spots which can then be raked smooth. Rolling should not be used to correct uneven spots. Once leveled the surface 1/4" should be raked to create a slightly loose seedbed.

Grass Selection

When selecting the grass species and cultivars try to balance the conditions of the site against the expected use. Consider the intensity of use, the desired quality, and the potential pest problems in view the physical limitations of the site. For most lawns a seed mixture of Kentucky bluegrass, perennial ryegrass and fine fescues should result in an acceptable turf. A properly selected seed mixture will result in a quality turf over the range of conditions found at the site. Guidelines for seed mixes and seeding rates can be found in Table 1.

In addition to selecting the mix of species, consider using a blend of varieties for the dominant species in a mix. Similar to mixtures, a blend of cultivars will increase the range of adaptation of the seed mix. For example, include a shade tolerant Kentucky bluegrass in a general lawn mix or select cultivars with differing disease resistances. Normally a blend will be composed of at least three varieties. Finally give strong consideration to including endophytic varieties of grass when ever possible. The presence of endophytes confers some resistance to surface feeding pests such as chinch bugs and bluegrass billbugs. Endophytic varieties of perennial ryegrass, tall fescue, chewings fescue, and hard fescue are currently available. Information regarding the performance of selected varieties can be found in the Cornell Turfgrass Species and Variety Recommendations.

Seeding

Seeding rates for a variety of situations are listed in Table 1. Seed can either be broadcast over or drilled into the seedbed. In both cases split the seed into two equal portions and seed in two directions. Drop spreaders are preferred over rotary spreaders especially where the seed is very small (i.e. creeping bentgrass) or if the mixture contains seeds of widely different sizes and densities. Hydroseeding should be considered for steeper slopes or for areas where it is difficult to use other equipment. When seeding, apply a starter fertilizer at a rate of 1 lb N per 1,000 square feet. Good products will have a fertilizer ratio of approximately 3-4-1. After spreading the seed and fertilizer the area should be raked to incorporate both seed and fertilizer into the top 1/4" of soil. Some of the seed should still be visible after raking. Then roll the area lightly to assure good soil seed contact.

Mulch

Mulch is extremely valuable, especially where supplemental irrigation is not available. Straw mulches, for example, create a microclimate favorable for seed germination and help protect the soil surface from erosion. Water infiltration is also enhanced as the mulch slows the rate at which water moves across the soil. Straw mulches should be about 1 inch thick but the soil surface should still be visible. Plan on using between 80 - 100 pounds of mulch per 1,000 square feet. If wind is a concern an asphalt or cellulose mulch can be used as a binder to hold the straw in place. Alternatively use the asphalt mulch alone. Avoid hay because of the potential for introducing weeds into the site.

Post Planting Care

Irrigation will promote both rapid seed germination and vigorous establishment. Light frequent waterings which keep the seedbed moist but not waterlogged are preferred. As establishment progresses the frequency of irrigation can be reduced and the amount applied at a single irrigation increased. Try to continue to irrigate the turf for at least 3 weeks after germination and preferably until lawn is completely established. Irrigation is more important when undertaking a spring seeding and almost a necessity when seeding Kentucky bluegrass in the spring.

Mowing for most general lawn mixes can start when the seedlings have grown to about 3 inches tall. Mowing will encourage the seedlings to tiller, rapidly increasing turfgrass density. Make sure the mower blades are sharp. Ragged cuts from dull mower blades damage the plants and will slow the rate of establishment. [Creeping bentgrass seedlings should be about one inch tall before the initial cutting. Set the cutting height at about a half inch and maintain that height for two or three more mowings. Then reduce the mowing height to the desired level.]

Three to four weeks after germination, fertilize the turf again. Use a complete fertilizer, either a second application of the starter fertilizer or apply another complete fertilizer having a ratio of 2-1-1. Apply enough fertilizer to deliver 1 lb. N per 1,000 square feet.

Almost every new seeding will have some level of weed infestation. Many of the weeds that germinate in new plantings will not tolerate mowing and will be easily controlled after mowing starts. Summer annual weeds which may germinate in fall plantings will not survive the winter and should pose no serious problems. The control of more persistent broadleaf weeds with postemergent herbicides should be delayed until after the third mowing. Do not apply fenoxaprop until the turf is fully established. Most preemergent herbicides should not be applied until after the turf is fully established. Exceptions are siduron which can be used at the time of seeding, and DCPA which can be used after the new seedlings have a minimum of 2 inches of growth.

David B. Davidson,
Dept. of Floriculture and Ornamental Horticulture

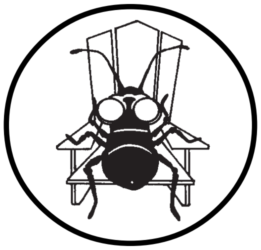
Late summer through early fall is the preferred period for turfgrass establishment in New York.

Remember that seeding will have to be postponed about 16 weeks after the application of most preemergent herbicides and 4 weeks after the application of most postemergent herbicides.

Table 1. Examples of Seeding Mixes and Rates for Selected Turfgrass Uses.

Use	Species/Mix (% by weight)	lbs Mixture (per 1,000 sq. ft.)
Golf Courses	100% Creeping Bentgrass (single variety)	1
Greens & Tees	100% Creeping Bentgrass	1
Fairways	100% perennial ryegrass blend*	6-8
	80% Kentucky bluegrass blend, 20% perennial ryegrass	3-4
Athletic Fields	80% Kentucky bluegrass blend, 20% perennial ryegrass	3-4
	100% perennial ryegrass blend*	6-8
	100% tall fescue blend* (southeastern New York)	7-10
Lawns (sunny) Medium-High*	70% (or more) Kentucky bluegrass blend, 10-20% perennial ryegrass, remainder fine leaf fescues	3-4
Low-Dry	65% fine fescue blend, 10-20% perennial ryegrass remainder Kentucky bluegrass blend	4-5
	100% tall fescue blend (southeastern New York)	7-10
Lawns (shady) Dry	65% fine fescue blend, 10-20% perennial ryegrass, remainder a blend of shade tolerant kentucky bluegrasses	4-5
	80% shade tolerant Kentucky bluegrass blend, 20% perennial ryegrass	3-4
Wet	70% rough bluegrass, 30% shade tolerant Kentucky bluegrass blend	2-3

** Tall fescue and perennial ryegrass are not winter hardy in the northern parts of New York State, especially away from the Great Lakes.*



Pest Watch

These experiments clearly demonstrated the impact which weather conditions may have on the residual activity of a preemergent herbicide.

Fall in the Northeast provides optimal growing conditions for grasses to recover from summer stresses.

Research Update: Herbicide Treatment to Reseeding Intervals

In the past three years we have conducted research to determine the safe intervals for reseeding turf into areas which have received preemergent herbicide applications. One of the surprising results was a distinct difference between years.

In 1990, pendimethalin displayed a remarkable degree of safety when bluegrass and perennial ryegrass were seeded just 8 weeks after treatment. However, in 1991 turf seedling establishment was dramatically reduced with a 12 week treatment-to-seeding interval. In 1990 we had a rather moist summer but in 1991 we had a very dry summer. Under these dry conditions the herbicide did not decompose as rapidly.

These experiments clearly demonstrated the impact which weather conditions may have on the residual activity of a preemergent herbicide. Unfortunately we cannot accurately predict the concentration of herbicide still present in the soil based on weather models. The safest way to be sure it is safe to reseed is to conduct a bioassay; in other words, test the soil before you waste money on seed and fertilizer. For instructions on how to conduct a bioassay see CUTT Vol. 2, No. 2 or contact your local Cornell Cooperative Extension office and request a copy of Weed Facts #3, "Conducting a Bioassay for Herbicide Residues".

Pendimethalin was used in this study as a common turfgrass herbicide. Other preemergent herbicides would respond similarly. Consult the herbicide label for safe treatment to seeding intervals.

Joseph C. Neal,
Dept. of Floriculture and Ornamental Horticulture

Fertilize Now for Healthy Turf

We often hear the phrase that the best pest management strategy is growing healthy turf. Fall, more than any other time of year, is the best time to fertilize cool season grasses. In normal summers, the stresses of heat and drought take their toll on grasses. Rooting is shallow, lawn areas may be thin, and generally the plants are weak. Fall in the Northeast provides optimal growing conditions for the grasses to recover.

Fertilizing lawn areas in the early Fall with a complete, balanced fertilizer sets the grass on the right path to recovery. Plan on fertilizing lawn areas between mid-August through the end of September. Use a fertilizer with an approximate nitrogen:phosphorus:potash ratio of 4-1-2. Examples would include a 20-5-10 and a 24-6-12. Quick release, or combinations of quick release and slow release nitrogen sources are ideal. Apply the fertilizers at a rate of one pound of nitrogen per 1,000 square feet.

Strengthening those weak lawn areas now will mean fewer problems next summer.

Norman W. Hummel,
Dept. of Floriculture and Ornamental Horticulture

Cornell Cooperative Extension

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