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Winter 1979

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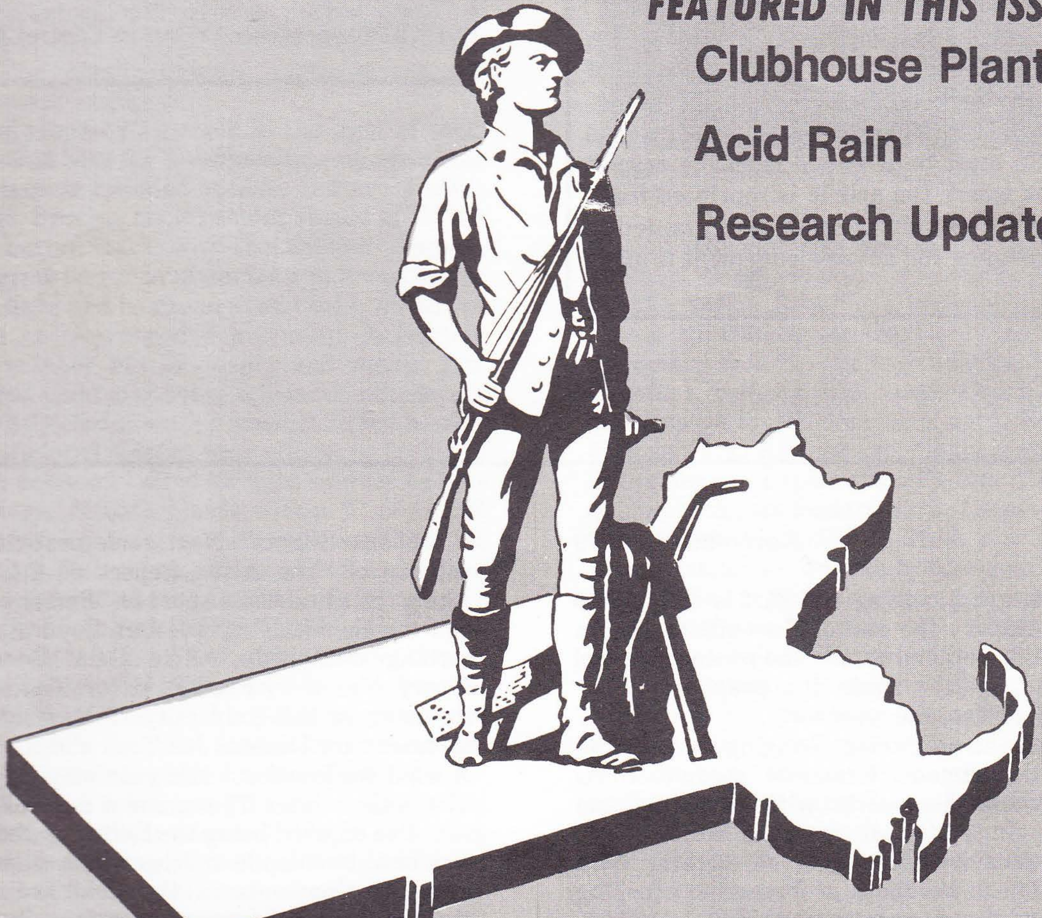
TURF BULLETIN

MASSACHUSETTS TURF AND LAWN GRASS COUNCIL INCORPORATED



FEATURED IN THIS ISSUE:

Clubhouse Plants

Acid Rain

Research Update

WINTER 1979

BETTER TURF THROUGH RESEARCH AND EDUCATION

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Vol. 15, No. 4 **Winter 1979**

Massachusetts Turf & Lawn Grass Council Officers

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The Massachusetts Turf and Lawn Grass Council Incorporated is chartered under the laws of the Commonwealth of Massachusetts as a non-profit corporation. The turf council seeks to foster "Better turf through research and education."

More detailed information on the subjects discussed here can be found in bulletins and circulars or may be had through correspondence with the editor.

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November 28, 1979

Hello Readers:

The forsythia are blooming and turf is starting to grow again. Too bad it's the end of November. After a record early frost in September and the proceeding cool fall New England is once again the prey of Mother Nature. If I could control the weather . . .

Weather's not the only thing changing in Amherst, so is the turf department. Graduate student Chris Brookes is finishing his work with nitrogen and potassium ratio's in perennial ryegrass while Steve Rackliffe is entering with thoughts of working with potassium's relation to hardness of Penncross creeping bentgrass. Another change in my exit as Research Technician and Editor of this Turf Bulletin. Filling the positions will be Malcolm Chisolm. He presently is the Assistant Superintendent at Wyckoff Park. I'm sure both Steve and Malcolm will be assets to the department and that you'll be hearing from them soon.

This final issue for me is the best yet. John Tristan, director of Durfee Conservatory is opening the issue with "Clubhouse Plants". Next some pesticide news and the validity of "The Alsea Report on 2,4,5-T" questioned. Along the same line a short on "Better pest control: with half the chemical," by Joe Dan Boyd. And a subject concerning everybody, "Acid Rain: Something Else to Worry About? by Fred P. Miller. To keep us abreast of the news in the University of Massachusetts Turf Department are Doctors Joe Troll and Kirk Hurto. A little of what we found out this year may help you next year. That's the winter '79 issue in a nutshell, enjoy it.

I've enjoyed being the Editor of the Turf Bulletin. It was hard to compile articles which weren't old hat since most developments in the field are reported on by the various major trade publications. But I tried. I'm sure Malcolm will put out a good magazine, and with a little help from you it will be even better. Let's keep the profession moving ahead.

Happy holidays to all
Pat Kristy

Clubhouse Plants

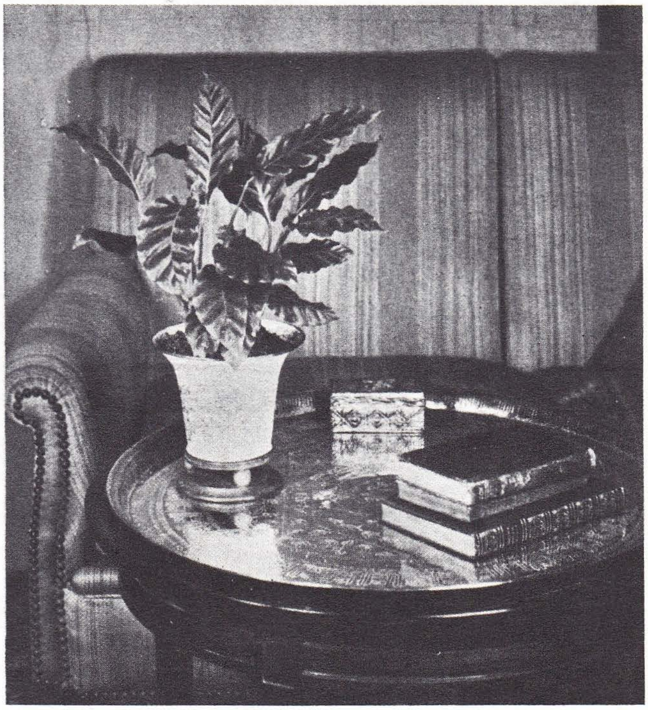
By John Tristan
Director, Durfee Conservatory

The clubhouse is the heart of any golf course and should provide a pleasant transition for the outdoor sportsman coming and going. Why not make a small extra effort to try and extend the beauty of your well-cared fairways into the clubhouse? Easy maintenance indoor plants can readily reflect outdoor forms of nature and enhance the architectural design and building layout much to everyone's enjoyment. Plant groupings as 'living pictures' will break the monotony of blank walls, round and soften stark corners and fill empty spaces with life. The effect created can open up interiors with new dimension. Large rooms can also be separated with container specimens to cozy private sections and entrances created at will. A window view framed by living plants as one sits in the restful, green privacy of a sheltered armchair will ease any bogie or sand-trap memories. On a smaller level, certain points of interest such as an end table, a table in a hall, a low bookcase or a stairway window can be accented with potted plants. Mirrors carefully positioned with plant companions will give a double effect of everything in sight and reflect an interior beautified with living plants. The possibilities for improvement are numerous and worth considering.

When using plants, view them in the light of their structural form and aim for a composition of agreeable shapes. Fill in gaps in rounded accents and avoid 'mutt and jeff' pairings. Spacing arrangement should allow the outer leaves to barely touch; with this amount of space, the plants will grow larger in diameter and lower leaves will get enough light and be green at all times. Avoid too many plants in an overcrowded profusion. Attraction here is not in number but in quality and choice. Emphasize an elegant plant as a living sculpture and place it where it will be reflected in waxed wood, polished marble or other glossy surfaces. Center your efforts on trying to utilize the room decor and all of its light sources to best possible advantage. Situate plants within 8" of bright windows to maximize natural light reception and provide artificial light (cool fluorescent) if necessary to interior areas. Aim for a minimum range of 250-500 ft. c. for 12 hours to keep growth in an attractive state.

Small water tight trays filled with 2" of pebbles or sand make ideal holders for groups of pots. 'Double potting in glazed, solid enamel crocks will eliminate water runoff and dress-up the common greenhouse pot nestled within. Hanging baskets centered under skylights, terrariums on a pedestal surrounded by other plants and plant tiers in shelved groupings can readily be constructed. Wall brackets for trailing plants lend further interest and can either allow foliage trailing down along windows and door frames or wrap growing stems around themselves and containers.

When selecting from the many interesting kinds of plant to grow, choose those that require a minimum of care and can readily adapt to the indoor environment. The easiest to grow are non-flowering or foliage plants. A few time-proven suggestions grouped by category of use might prove helpful. The following plants are all commonly available varieties and should offer no special care troubles. *Large container specimens:* Howeia forsteriana (Kentia palm), Schefflera actinophylla (Umbrella tree), Fiscus sp. (Rubber trees), Cordyline marginata and C. terminalis, Podocarpus macrophylla, Monstera deliciosa, Grevillea robusta (silk oak), Codiaeum sp. (Crotons). *Hanging plants:* Hedera helix vars. (English ivies), Hoya carnosa vars., Rhipsalis sp. (Chain cacti), Pelargonium sp., Columnea sp., Espiscia sp., Plectranthus sp., Ficus pumila, Nephrolepsis exatata vars., Cissus sp., and Saxifraga sarmentosa var. 'tricolor'. *Table size:* (6" pots): Philodendron wendlandii, Spathiphyllum sp., Billbergia zebrina, Neoregelia sp. Rhoeo spathacea, Crassula argentea, Dracaena goldieana, Maranta and Calathea sp., Chamaedorea sp. (Dwarf palms), Peperomia sandersii, Adiantam sp., Pilea cadierei and P. microphylla.



Calathea louisae is just the right size for a coffee table.

When you are ready to purchase your plants, choose a well-known greenhouse grower of good reputation. In all fairness to the customer, specimen plants should be acclimatized somewhat beforehand to be able to maintain a decorative appearance in the indoor environment. You want the most for your investment and not a rapidly deteriorating failure, so be careful of your sources and plant quality. Even under the poorest conditions in a dark corner, properly acclimatized foliage should be expected to provide consumer's pleasure for 3-6 months. Carefully consider your growing conditions (primarily available light) and building layout. Then acquire a set of plants with a room in mind. Leaf shapes and colors must be agreeable. Assess central areas of importance first (i.e. main lounge) then move on to minor, spot locations that

A window planter box filled with foliage plants. The big plants give height, vines soften the edges. Plants are in individual clay pots inside the box.

could be improved with a plant or two. On arrival be sure and keep your plants evenly moist and do not fertilize for at least 3 to 4 weeks. Generous amounts of fertilizer applied to greenhouse media can cause you problems during the initial transitioin stage. If you let your plants get too dry, coupled with the reduced light and drier air of the clubhouse a sudden drop of older leaves, marginal leaf chlorosis or necrosis of newer leaves and severe root damage from excess salts can result. A possible safeguard would be too thoroughly leach all new plants with warm water to remove any high concentration of soluble salts. Wait several weeks before transplanting to other containers to minimize further shock.

Once adjusted and in permanent settings maintenance of the plants will be very reasonable. Regular watering to keep the soil condition evenly moist should be a short morning chore with a good 2 gal. watering can. Occasional shape pruning will also be needed. Don't let your window views be obscured and never let one robust plant totally overcome others in an arrangement. Keep foilage free of dust accumulations by periodic cleaning with a mister bath or wet sponge. Fertilize dilutely (1/2 strength recommended on label) during bright times of the year, once a month. Remember you are not after a profusion of rapid growth but a decorative appearance in harmony with the room size and layout. After caring for fairway ruts and winter kill, indoor plant care will seem easy.

Any questions or problems you need answered can be directed to Mr. John Tristan, Durfee Conservatory, c/o Plant and Soil Science Dept. 4, French Hall, Amherst, MA 01003.

Massachusetts Pesticide News

United States Department of Agriculture and County Extension Services cooperating Department of Entomology, Fernald Hall, University of Massachusetts (413) 545-0932

Endrin/Treflan/Benomyl: RPAR Outcomes

Recently EPA has made final decisions for several chemicals which it has been reviewing for various potential health problems. The conclusions of these reviews indicate that EPA intends to use its review process (RPAR) to tighten up pesticide use but does not intend to ban pesticides en masse. These decisions were:

Endrin: (Insecticide)

EPA decided that some endrin uses were harmful to wildlife, particularly aquatic things like fish and pelicans, and had to go. Consequently, EPA is seeking cancellation of certain uses, such as cotton in the southeastern U.S., while leaving other, non-offending uses such as for cotton in the arid southwest, in place.

Treflan: (Herbicide)

This widely used herbicide helps keep soybeans weed free. Unfortunately it has a contaminant in it called *nitrosamines.* These have been demonstrated to cause cancer in three test animal species. EPA has concluded that changing the way Treflan is manufactured so that nitrosamines are held at less than 1 ppm in the herbicide concentrate will prevent any significant problems. The manufacturer has agreed and all use of Treflan, in purified form, will continue.

Benomyl: (Fungicide)

Benomyl is a widely used fruit and vegetable fungicide. It was reviewed for effects on earthworms and its potential to cause birth defects or affect reproduction. EPA has decided that the likelihood of benomyl causing harm is small enough to allow continued use of all products.

These three decisions indicate that RPAR is not — as some pro chemical persons have feared — a means to ban pesticides wholesale. Instead RPAR is proving itself to be an effect way to sort and weigh evidence for and against pesticide uses and *make changes* as needed. This is a positive process that will benefit applicators and conservationist alike.

Pesticide Certification Workshops for Commercial Applicators in Mass., 1979-80

The following workshops will be offered this year for pesticide applicators seeking commercial certification. Applicators are reminded that they must attend a workshop within one year of taking their initial certification exams. A workshop is required for each category or subcategory of certification, although small subcategories are being combined in some cases (see schedule).

Applicators who are already fully certified and have taken both exams and workshops can obtain credit toward *recertification* by attending these sessions. Attendance at 3 sessions over the 5 year certification period will exempt a person from *re-examination* at the end of the 5 year period. No other sessions, industry or university, will be counted for this purpose. The calendar of events is as follows:

DATE	CATEGORY	TRAINER	PLACE	TIME	FEES
Jan. 3	CAT 10: Demo & Research	Roy Van Driesche	Waltham Field Station 240 Beaver St.	10:00 am- 3:00 pm	None
Jan. 8	CAT 7: Site Sanitation & Vertebrate Control	Roy Van Driesche & Ed Ladd of Fish & Wildlife Service	UMASS/Amherst Fernald Hall Room 102F	9:00 am- 1:00 pm	None
Jan. 10	Bat Proofing	Ed Ladd — Fish & Wildlife Service & Lew Wells — Mass. Dept. Food & Agric.	Waltham Field Station 240 Beaver St.	10:00 am 3:00 pm	None
Jan. 15	CAT 3: Ornamentals & Turf	Roy Van Driesche	UMASS/Amherst Fernald Hall Room 102F	9:00 am- 1:00 pm	None
Jan. 17	CAT 5: Aquatic Weeds	Mario Boschetti DEQE	Waltham Field Station 240 Beaver St.	10:00 am- 3:00 pm	None
Jan. 22	CAT 8: Public Health & Mosquito Control	Jere Downing & Roy Van Driesche	UMASS/Amherst Fernald Hall Room 102F	9:00 am- 1:00 pm	None
Jan. 24	CAT 7: General Exterminating, Food Processing & Termites — all three subcats.	Austin Frishman Univ. of N.Y. Farmingdale	Waltham Field Station 240 Beaver St.	10:00 am- 3:00 pm	$10.00 per person
Jan. [illegible]	CAT 2: Forest	Roy Van Driesche	UMASS/Amherst Fernald Hall Room 102F	9:00 am- 1:00 pm	None
Jan. 31	CAT 9: Regulatory	To Be Announced	Waltham Field Station 240 Beaver St.	10:00 am- 3:00 pm	None
Feb. 5	Core Manual Review	Roy Van Driesche	Waltham Ag. High Sch. Segreganset MA	10:00 am- 2:00 pm	None
Feb. 7	CAT 3: Ornamentals & Turf	Roy Van Driesche	Waltham Field Station 240 Beaver St.	10:00 am- 3:00 pm	None
Feb. 12	CAT 10: Demo & Research	Roy Van Driesche	UMASS/Amherst Fernald Hall Room 102F	9:00 am- 1:00 pm	None
Feb. 14	CAT 7: Site Sanitation & Vertebrate Control	Ed Ladd & Roy Van Driesche	Waltham Field Station 240 Beaver St.	10:00 am- 3:00 pm	None
Feb. 19	Core Manual Review	Roy Van Driesche	UMASS/Amherst Fernald Hall Room 102F	9:00 am- 1:00 pm	None
Feb. [illegible]	CAT 2: Forest	Roy Van Driesche	Waltham Field Station 240 Beaver St.	10:00 am- 3:00 pm	None

Reprinted with permission from "Weed Science Society of America Newsletter" October 1979

The Alsea Report on 2,4,5-T

The information which triggered the suspension of 2,4,5-T and silvex was a report prepared by EPA suggesting a correlation between the application of 2,4,5-T and the number of spontaneous abortions among women living in the Alsea area of Oregon. Hospital records were examined for a six-year period beginning in 1972. The Alsea or "study" area included parts of three counties along the coast. A "control" area was selected in Malheur County, eastern Oregon, where use of 2,4,5-T was reported to be slight. Both areas are rural, but aside from this there is little indication of other similarities.

An "urban" area was also selected for comparison with the study area encompassing the cities of Corvallis and Albany, Oregon.

The news media has printed stories which refer to 130 spontaneous abortions in Alsea during the month of June, two or three months after applicaton of 2,4,5-T. The obvious implication was that 130 abortions were attributed to the effects of 2,4,5-T in this one month over a six-year period — a rather frightening statistic. EPA Deputy Administrator Barbara Blum issued a statement saying there was an alarming correlation between the high miscarriage rate and the application of 2,4,5-T in the forests. Steven Jellinek, Assistant Administrator for Toxic Substances, was quoted as telling newsmen EPA had not suspended 2,4,5,-T sooner because it had no definite proof of harm to humans. Now "we have dead bodies, dead fetuses."

Does the Alsea Report warrant such emotional reactions? After reading the report and hearing what other scientists have to say, it appears the study was deficient in many respects and that the conclusions may not be correct. Certainly there has been a great deal of misunderstanding perpetrated by the news media.

In the first place there were not 130 spontaneous abortions recorded in June in the study area. The average over a six-year period was four. The number 130 was used to indicate the number of spontaneous abortions that might have occurred if there had been 1,000 births in the area. In other words, they used a common denominator of 1,000 for all the areas so that data from these areas could be compared. The "high" miscarriage rate in June was one more than the average of three which occurred in March. An increase of one is, of course, cause for concern if, in fact, the increase is real and not simply normal variation. Dr. Jim Witt, Agricultural Chemist at Oregon State University, has the data from the Alsea area showing actual numbers of abortions in June for each of the six years (only the six-year average was in the report). The "peak" of four in June was caused by an increase of abortions in only one year out of six, even though 2,4,5-T was applied every year. That year, 1976, there were 10 abortions in June. So the peak in June which "correlates" with earlier 2,4,5-T applications depends entirely on an increase in one year out of six. Furthermore, the women who aborted in June of 1976 were all from coastal cities several miles from forest applications of 2,4,5-T.

To a layman it's hard to see how these statistics could cause the concern expressed by EPA, but what do they mean to a biostatistician experienced with such studies? We have an answer from Dr. Nathan Mantel, Biostatistics Center, George Washington U. Dr. Mantel was commissioned by the National Forest Products Association to evaluate the EPA report. Although the Forest Product Association supports the need for 2,4,5-T in forests, this should not detract from Dr. Mantel's evaluation as he is a nationally known authority on the application of statistics to human health issues. In Mantel's judgment, "It would not be reasonable to accord my weight to the report's finding."

Dr. Mantel concludes there is no statistical difference in the abortion rate between the study area and the control area. The higher rate of abortions in the study area as compared to the urban area is statistically significant, but Mantel points out these two areas cannot be compared because of differences in medical facilities in them. Data on spontaneous abortions were taken only from hospitals, not from medical clinics, yet abortions are often handled in clinics, particularly during the first trimester of pregnancy. Since clinics were only available in the urban area, the number of abortions recorded by the hospitals in that area would be expected to be low. Thus there is considerable bias toward a greater number of spontaneous abortions being reported in the study area where there were no clinics. EPA acknowledged this difference between the two areas and said they were not suitable for comparison. Yet EPA made the comparison and concluded there was a higher abortion rate in the study area.

Recognizing that a certain number of spontaneous abortions can be expected normally (it has been estimated that 15 to 20 percent of all pregnancies end in abortion) Mantel suggests that if a chemical were influencing abortions in some way, you might expect it to affect the length of the gestation period prior to abortion. In this study there were no statistically significant differences in the length of the gestation period among the women who aborted at certain times during gestation remained the same before and after application of 2,4,5-T.

This is not a complete summary of Mantel's findings, but it shows there are significant questions about the reliability of the Alsea Report. Regardless of a person's views on the hazards of 2,4,5-T, it is not possible to ignore the serious discrepancies and contradictions in this report. Dr. Mantel's evaluation has been submitted to EPA.

Minor Uses Defined

The Environmental Protection Agency has issued this policy statement on Minor Uses:

"In general, a pesticide use is considered minor if its market potential is insufficient to economically justify the development of data required to establish a tolerance or obtain an exemption from the tolerance requirements of the Federal Food, Drug, and Cosmetic Act (FFDCA), and to register the pesticide use in accordance with the provisions of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) as amended. The availability of pesticides to meet minor use needs has long been a concern of the agricultural community, ornamental growers, and pesticide regulatory agencies of the State and Federal governments."

Tiny spray particles cling to plants after they've been electrically charged in special nozzles on a new FMC electrostatic sprayer. Compressed air released inside each nozzle (inset) atomizes the spray into a cloud of droplets that get a negative charge as they go past electrodes in the tip of the nozzle. Positive electrons in plants "attract" the droplets.

By Joe Dan Boyd

A $50,000 sprayer ought to be "something else," right? To justify such a price tag, you'd expect a combination of better pest control, lower chemical rates and generally improved efficiency.

You'll get all that and more, if FMC's Agricultural Machinery Division in Jonesboro, Ark., follows through with tentative plans for a 1980 introduction of a 130-hp., four-wheel-drive, self-propelled electrostatic sprayer (photos).

Electrostatic? The technology is new and unlike anything you've ever used unless you are helping FMC test one of eight experimental high-clearance models or four trailer-type units this season.

It's the delivery system that sets FMC's new sprayer apart from other electrostatic applicators that have been tried since the early 1950s.

A metering pump feeds spray solution to each nozzle, while a pressure regulator and air compressor connect to other jets inside the nozzle. The result is a spray cloud of pneumatically atomized droplets, each only 30 to 50 microns in diameter, delivered from nozzles hovering 6" to 12" above the crop.

Before delivery, however, these ultra-low-volume droplets get a negative induction charge of about one milliamp per nozzle. Small electrode charging caps — embedded near each nozzle tip — drew power from the engine alternator and from a 12-volt D.C. battery.

Positive electrons in grounded plants "attract" the negatively charged spray droplets something like a magnet, resulting in uniform coverage of stems and leaves with very little "drift."

Using one half the normal rate of Pounce on cotton, the new sprayer matched or bettered *Heliothis* (budworm and bollworm) control from conventional, full-rate ground and air applications in FMC tests.

FMC reports less chemical waste, less drift and better control than from aerial sprays, and better coverage in the top one third of the crop canopy than with conventional ground equipment.

Herbicides, fungicides and defoliants also look good in electrostatic tests. Lower rates can be a real plus with some of the newer, more expensive chemicals such as the synthetic pyrethroid insecticides.

"We're looking at rates that are one half of normal to perhaps as little as one eighth, eventually," speculates Michael Lane, FMC's design engineer.

Who can afford a $50,000 sprayer? "That's only a ballpark figure," says Carl Cilker of FMC. "We won't know the actual price until we get into production." FMC figures custom operators and big growers can make the sprayer "pay for itself," especially with chemicals like synthetic pyrethroids.

Acid Rain: Something Else to Worry About?

By Fred P. Miller
Soil and Water Resource Specialist
University of Maryland College Park, Md 20742

In both the popular press and scientific media, articles are appearing with increasing frequency about a 20th Century weather phenomenon — acid rain.

The acidity of precipitation has gradually increased in certain area's of the U.S. over the last three decades. This acidity problem was associated primarily with the industrial air pollution in the northeastern U.S. and in the industrial sectors of Europe during the mid-1950's. The problem has since expanded to other regions.

By 1972, precipitation in most areas east of the Mississippi River was more acidic than normal. Rainfall is naturally acidic (pH 5.6) as small amounts of carbon dioxide are dissolved in the water, producing a mild concentration of carbonic acid. But as the atmosphere is loaded with sulfate and nitrate pollutants, the strength of the resulting sulfuric and nitric acids increases. The pH of individual rain events has been recorded at values between 2.1 and 3.0 in various locations. (1).

The effects of this acid precipitation on soils, vegetation, water, and aquatic organisms is not well researched.

Scientists in Oregon (1) have simulated acid rain experiments on sugar maple ecosystems and compared their results with the conditions found under normal rainfall. Under acid rainfall, calcium, magnesium, and sulfate ions were leached from the soil in higher concentrations than under normal conditions. An increase in the input of hydrogen and sulfate ions was noted in the water passing from the forest litter to the soil. There was also an increase in the removal of calcium from the leaf litter (1).

Other research results in cool, temperate regions of the northeastern U.S., Canada, Norway, Sweden, and Germany (2) indicate that one of the most dramatic effects of acid precipitation is the increased aluminum mobilization in soils. Aluminum is derived principally from rock weathering. Its solubility increases drastically in the pH range from 7 to 5.

The increased acidity of the percolating water carries the dissolved aluminum deeper into the soil profile than normal, often transporting it to streams and lakes. Studies in New York's Adirondacks (2) showed that aluminum concentrations in acidified lakes were 10 to 50 times higher than normal. Similar results in Scandinavia indicate increased aluminum transport to both streams and lakes.

But these types of studies have been carried out on predominantly upstream waters where the aluminum solubility plays a major role in their chemical composition. The effect of the acid precipitation downstream becomes less as normal soil weathering reactions dominate the composition of downstream waters (3).

Chemical data from other watersheds (3) in the northeastern U.S. show that the neutralization of acid rain is rapidly and largely (about 75%) accomplished in the upper soil or substrata by reaction with basic aluminum salts and organic matter. The remaining acid is neutralized by chemical weathering reactions within the soil parent material.

Thus, the presence of high concentrations of aluminum reported in water draining areas subject to acid rain is confined mainly to the upper portions of the watershed. This aluminum enrichment will be especially noticeable in alpine and upland lakes where small streams drain watersheds composed of igneous and metamorphic bedrock. Downstream water quality in major streams will not be likely to exhibit any acidifying effect (3). This additional soil acidity can be managed for agricultural systems by current liming programs.

The agricultural impact of acid rain is both a blessing and a curse. The sulfur added through air pollution is often adequate to sustain crop needs without amendments, thus saving the farmer the expense of such additions. But the implications of acid rain on soil pH, aluminum release, plant communities, long term soil formation processes, and other systems are only just beginning to be uncovered.

As air pollution is brought under control, the impact of acid rain should lessen. In the meantime, the problem is worthy of watching, but seems to pose no immediate threat to agriculture and the soil resource base. We should not, however, wait for problems to appear before cleaning up the source.

1. Acid rain. Sport Fisheries Institute Bull. No. 304, May 1979. p.p. 5-6.
2. Cronan, C. S. and Scholfield, C. L. 1979. Aluminum leaching response to acid precipitation: Effects on high-elevation watersheds in the Northeast. Science. 204: 304-306.
3. Johnson, N. M. 1979. Acid rain: Neutralization within the Hubbard Brook ecosystem and regional implications. Science. 204: 497-499.

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UMass Turfgrass Research Update — 1979

By K. A. Hurto, Joseph Troll and Pat Kristy

Turf research at the University of Massachusetts encompasses a broad range of studies relevant to New England's needs including: cultivar evaluation, turfgrass nutrition and fertilization practices, pesticide evaluation and development of cultural programs for low maintenance turfs, home lawns, golf courses, and sports turf facilities. New England's climate and soil conditions are varied, therefore requiring attention to factors associated with the adaptation and culture of turfgrass for our region.

Cultivar Evaluation: Numerous cultivars have been introduced by plant breeders which exhibit differences in leaf color and texture, shoot density, disease resistance, adaptation, and cultural requirements. Currently, cultivars and varieties representing the following species are under trial: Kentucky bluegrass, fine fescues, perennial ryegrass, and zoysiagrass. Knowledge of how these species perform under varying environmental conditions and cultural intensities enables turf managers and specialists to select cultivars that are best adapted to their needs.

Forty-four cultivars of Kentucky bluegrass were planted May 30, 1978, and are maintained at mowing heights of 0.75 and 1.5 inches. Fertilizer is applied in April, June, August, and September to provide 4 lbs /1000 sq. ft./yr. using a 10-6-4 analysis fertilizer which is 50% water soluble and 50% slowly soluble.

Extended periods of ice cover this past winter resulted in injury of Kenblue, Park, S-21, Troy, Vantage, and A-34, and slight injury of Plush, Scenic, Adelphi, Holiday, Parade, and Rugby. Other cultivars exhibited little or no winter injury. Spring turf quality was affected by the incidence of *Helminthosporium* leaf spot (Table 1). Those cultivars moderately or severely infected include: Kenblue, Plush, Rugby, S-21, Troy, and Vantage. At close mowing height cultivars which have performed better include: Banff, Fylking, Haga, P-164, Princeton, and Touchdown. At 1.5 inch cutting height the following cultivars have performed well: Bonnieblue, Columbia, Fylking, Haga, Majestic, Merion, Nugget, P-164, Parade, Princeton, Ram I, Rugby, Sydsport, Touchdown, Trenton, and Windsor.

Fine-leaf fescues (creeping red, red, Chewings, and hard) are well adapted to well-drained sites. They can provide an excellent turf in dry, shaded areas or on low maintenance areas. The present varietal evaluation represents 35 entries which were planted September 23, 1978, to evaluate their performance at cutting heights of 1.5 and 3 inches. Plots are mowed twice weekly and are fertilized four times per year to provide 3 pounds of nitrogen per 1000 sq. ft. using a 10-6-4 analysis fertilizer.

Spring quality of fine fescue was better than summer quality, reflecting their climatic adaption (Table 2). Biljart, Fl 1, Jamestown, Longfellow, Scaldis, Silvana, ST, and Walding have performed better than other cultivars under evaluation in this trial. A midsummer applicaton of DSMA at recommended rates for post-emergence crabgrass control resulted in severe injury of the plots. This is reflected in August and September ratings.

Varieties adapted to low management conditions are characterizd by tolerance to environmental extremes, disease resistance, and high shoot density which precludes encroachment by other species. In a study initiated in May, 1976, 25 varieties representing 6 turfgrass species were planted on a loamy sand to determine their

Table 1. Performance of Kentucky bluegrass cultivars maintained at two cutting heights.

Cultivar	Mowing Height	Spring Green-up[1]	Helminthosporium Leaf Spot[2]	Quality[3] 5/8	5/22	6/22	7/4	8/1	9/5
A-20	.75	3.0	1.5	2.3	4.0	5.0	3.7	3.3	4.3
	1.5			3.3	5.7	5.7	5.0	4.3	5.3
A-20-6	.75	3.0	1.7	2.3	5.3	5.3	4.7	3.3	5.3
	1.5			4.0	6.3	6.0	5.0	4.7	6.3
A-29-10	.75	4.3	1.3	2.3	5.0	4.3	4.0	3.3	4.3
	1.5			3.0	5.3	5.3	4.0	4.0	5.0
A-34	.75	4.0	2.3	3.0	4.7	6.0	5.7	5.3	7.3
	1.5			3.7	5.7	6.0	6.3	6.0	7.0
Adelphi	.75	4.3	1.7	3.0	4.7	5.7	4.7	5.0	6.7
	1.5			4.3	5.7	6.7	5.3	5.0	6.7
Aquila	.75	3.0	1.7	3.3	5.0	5.7	5.3	5.0	4.7
	1.5			3.3	6.3	5.3	5.3	5.0	5.7
Arista	.75	5.0	1.5	3.7	6.3	5.7	5.3	4.7	5.0
	1.5			4.0	6.3	6.0	5.7	5.7	6.7
Ba74-501	.75	5.7	1.2	3.3	6.3	7.0	6.0	4.7	6.0
	1.5			4.0	6.3	6.3	6.0	5.3	6.3
Banff	.75	7.3	1.0	3.0	6.7	7.0	6.7	6.7	7.3
	1.5			3.3	6.0	6.7	6.3	6.0	7.3
Baron	.75	4.3	1.3	4.0	6.0	6.7	6.3	5.3	6.0
	1.5			3.3	6.3	6.0	6.0	5.3	6.3
Birka	.75	5.5	1.5	4.5	6.5	7.0	5.0	5.3	6.0
	1.5			4.3	6.7	6.7	6.0	6.0	6.0
Bonnieblue	.75	4.7	1.3	4.3	6.3	7.0	6.0	5.3	6.7
	1.5			5.0	6.3	7.0	6.0	5.7	7.7
Bristol	.75	4.7	1.0	3.7	7.0	6.3	6.3	4.7	6.3
	1.5			4.3	7.0	6.3	5.7	5.3	7.0
Brunswick	.75	4.7	1.2	3.0	5.7	6.3	5.7	5.0	6.0
	1.5			3.3	6.0	6.0	5.3	5.0	5.7
Cheri	.75	4.0	2.0	3.7	6.7	6.3	6.3	6.0	6.3
	1.5			4.3	5.7	6.0	5.3	5.7	6.3
Columbia	.75	7.0	1.3	3.3	6.3	6.3	5.7	5.7	6.0
	1.5			4.0	7.0	7.3	6.3	6.3	7.3
Fylking	.75	4.7	1.8	4.7	7.3	7.3	7.3	6.0	6.3
	1.5			5.0	6.3	6.3	6.3	6.3	6.7
Glade	.75	4.3	2.0	3.3	5.7	6.0	6.7	5.0	6.7
	1.5			4.3	6.0	6.0	6.7	6.3	6.3
Haga	.75	6.3	2.0	4.3	7.0	5.7	6.7	6.0	6.3
	1.5			4.3	7.0	6.7	6.3	5.3	7.0
Holiday	.75	4.0	2.2	3.3	4.7	5.3	5.3	4.7	5.3
	1.5			4.3	5.3	5.7	5.7	5.0	6.7
I-13	.75	3.3	2.0	3.0	6.0	6.7	6.3	5.3	7.3
	1.5			4.0	7.0	6.0	6.0	5.0	6.0
IS-28	.75	4.7	1.7	3.0	6.3	6.7	6.0	4.7	6.3
	1.5			4.3	7.3	6.0	5.7	5.3	6.3
Kenblue	.75	3.0	3.0	2.0	3.0	3.7	4.3	4.3	5.3
	1.5			3.0	4.0	4.0	4.7	4.7	6.0
Majestic	.75	4.7	1.5	3.3	6.7	6.7	7.0	5.7	6.3
	1.5			5.0	7.3	6.7	6.3	5.7	7.0
Merit	.75	5.0	2.0	3.3	5.3	6.3	6.0	5.3	6.0
	1.5			3.7	5.3	5.7	5.7	5.3	6.3
Merion	.75	3.0	1.7	3.0	5.0	5.3	5.3	5.0	5.7
	1.5			4.3	6.3	6.3	6.7	5.7	6.7
Newport	.75	4.0	1.3	2.7	4.7	6.0	4.7	4.7	5.7
	1.5			4.7	6.3	6.3	6.3	5.3	5.3
Nugget	.75	3.0	1.0	3.0	7.3	7.0	6.7	4.7	5.0
	1.5			4.7	8.0	7.7	7.3	6.3	6.0
P-164	.75	4.3	1.5	3.7	6.3	7.7	6.7	5.7	6.7
	1.5			5.3	6.7	7.0	6.3	6.7	7.3
Parade	.75	5.0	1.8	4.0	6.0	6.7	6.3	6.3	6.3
	1.5			4.7	6.0	6.3	6.3	6.0	7.0
Park	.75	4.0	2.0	2.7	3.0	4.7	4.3	4.7	5.3
	1.5			3.7	4.6	4.0	4.7	5.0	6.0
Plush	.75	4.0	2.5	3.3	5.3	5.7	5.3	5.7	7.0
	1.5			3.7	6.0	6.3	6.3	6.0	6.7
Princeton	.75	3.7	1.3	4.0	7.0	6.3	6.7	5.7	7.0
	1.5			4.7	6.3	7.0	6.7	6.7	7.3
Ram I	.75	5.3	1.8	4.0	6.3	6.3	6.3	6.3	6.3
	1.5			4.0	7.3	6.3	5.7	6.7	8.0
Rugby	.75	4.7	2.7	3.7	5.3	6.0	5.7	5.3	6.3
	1.5			4.0	6.3	6.3	6.3	5.7	7.3
S-21	.75	3.3	2.7	2.6	3.0	4.0	4.0	4.0	5.3
	1.5			3.3	4.3	4.3	5.0	5.0	5.7
Scenic	.75	3.0	2.3	3.0	3.7	4.0	5.0	5.0	5.3
	1.5			4.0	5.3	5.0	5.3	5.7	6.0
Sydsport	.75	3.3	1.7	3.7	6.7	6.7	6.3	6.0	[illegible]
	1.5			4.7	7.0	6.3	6.3	6.3	[illegible]
Touchdown	.75	5.7	1.0	3.3	7.0	7.0	7.0	5.7	7.0
	1.5			4.0	6.3	7.3	6.7	7.0	6.7
Trenton	.75	5.7	1.7	3.7	6.0	6.7	6.3	5.3	6.7
	1.5			4.0	6.3	7.0	6.7	5.3	7.0
Troy	.75	4.7	3.0	3.0	3.0	4.0	4.0	3.3	4.3
	1.5			3.3	4.0	4.3	4.3	4.0	5.7
Vantage	.75	3.3	3.3	2.3	3.0	3.7	4.0	3.3	4.0
	1.5			3.3	3.7	4.0	4.7	4.7	5.3
Victa	.75	4.7	2.0	3.3	5.3	6.0	5.7	5.0	5.7
	1.5			4.0	5.7	5.7	6.0	5.3	6.7
Windsor	.75	4.7	1.7	3.0	5.3	5.3	5.0	50	6.0
	1.5			4.0	6.7	7.0	7.0	7.0	7.3

[1]Green-up ratings were made on 4/12/79 on a scale of 1 to 9, 9 representing an ideal green.

[2]*Helminthosporium* leaf spot ratings were made 5/22/79 using a scale of 1 to 5; 1 representing no infection, 2 slight infection, 3-4 moderate infection, and 5 severe infection.

[3]Quality ratings were made on a scale of 1 to 9, with 9 representing ideal turf.

performance under low management conditions. Except during establishment, plots were not irrigated. Plots were moved at 1.5 and 3.0 inches once per week and fertilized in the spring and fall to supply a total of 1.5 lbs. N/1000 sq. ft./yr. using a 10-6-4 analysis fertilizer.

The red fescues have performed slightly better than other species (Table 3). Outstanding entries include 'Scaldis' and 'Centurion' hard fescue. These varieties have excellent shoot density, uniformity, and turf quality. Kentucky bluegrass, with the exception of 'Merion' have not performed well under these conditions, reflecting their susceptibility to *Helminthosporium* leaf spot disease. Perennial ryegrass and tall fescue are not adapted due to their susceptibility to winter injury. Perennial ryegrass forms a medium-textured turf with good shoot density and better wear tolerance than Kentucky bluegrass. Traditionally, perennial ryegrass is considered a shortlived perennial because of its poor tolerance to climatic stress. It is best adapted to cool, humid regions that have mild winters and cool summers. Recent interest by turfgrass breeders and the seed industry has resulted in the release of numerous improved turf-type perennial ryegrass varieties which exhibit better mowing quality, a more diminitive growth habit, and improved potential for use as a permanent turfgrass in monostand and polystand communities with Kentucky bluegrass. The rapid establishment rate, better wear tolerance, and minimal thatching tendency of perennial ryegrass make it a desireable turfgrass for parks, athletic fields, and golf courses.

The severe winters of New England, particularly those associated with ice cover, have limited its adapta-

Table 2. Performance of fine fescue varieties maintained at two cutting heights.

Variety	Mowing Height	Spring Green-up[1] 4/12	Quality[2] 5/22	6/19	7/3	8/1	9/5
Flana	1.5	3.7	6.7	7.3	5.0	1.3	2.0
	3.0				6.3	2.3	4.3
Walding	1.5	7.3	6.7	7.3	6.7	4.7	5.3
	3.0				6.0	4.7	6.3
Damson	1.5	5.0	7.0	6.3	3.7	1.0	2.0
	3.0				6.3	4.0	5.0
Silvana	1.5	7.3	7.3	8.0	5.7	2.7	3.7
	3.0				4.7	3.7	5.0
Scaldis	1.5	6.0	6.3	7.0	5.7	2.7	3.3
	3.0				5.3	3.3	5.0
Scarlet	1.5	4.3	6.3	5.3	3.3	1.3	2.7
	3.0				5.7	3.3	5.0
Balmoral	1.5	4.7	6.7	7.3	5.7	1.7	2.7
	3.0				5.3	2.7	4.3
Mon FRR 25	1.5	6.3	6.3	4.3	3.0	3.0	3.0
	3.0				3.3	3.7	6.0
Mom FRR 33	1.5	5.7	6.0	4.7	4.0	3.3	3.3
	3.0				5.0	4.0	4.3
Mom FRR 4211	1.5	3.7	6.0	6.0	4.0	2.7	3.0
	3.0				5.7	2.7	5.3
Moncorde	1.5	5.7	6.3	4.7	3.3	1.3	2.7
	3.0				5.3	2.7	5.0
Mom FRC 61	1.5	3.7	7.3	5.7	3.3	2.0	2.3
	3.0				4.3	2.7	4.3
Mom FRC 62	1.5	7.3	7.3	5.0	3.0	3.0	3.3
	3.0				6.0	3.3	5.3
Mon FRC 10	1.5	3.7	6.7	5.0	3.0	1.3	2.0
	3.0				5.7	2.3	4.0
Mom FRC 12	1.5	5.0	6.3	5.3	3.3	2.7	2.7
	3.0				5.0	3.3	5.0
Mom FOD 11	1.5	5.3	6.0	6.3	6.3	2.3	3.0
	3.0				4.7	2.0	4.0
[illegible]sylva	1.5	5.0	6.3	4.7	4.3	2.7	3.3
	3.0				3.7	4.0	4.0
Checker	1.5	4.7	7.0	7.3	4.3	2.7	3.0
	3.0				5.0	2.0	4.7
Highlight	1.5	3.7	6.7	6.7	4.7	3.0	2.7
	3.0				5.0	2.3	4.3
Fl 1	1.5	7.7	7.7	7.3	5.3	2.0	2.3
	3.0				5.0	3.3	5.0
Jamestown	1.5	2.3	6.7	6.7	6.0	2.3	3.0
	3.0				6.7	3.0	5.0
Syn W	1.5	4.3	7.3	6.7	3.7	1.3	2.0
	3.0				5.0	2.7	4.7
Biljart	1.5	6.3	7.0	7.0	6.0	4.0	3.7
	3.0				4.0	4.0	5.3
Kensington	1.5	4.0	6.7	5.3	4.3	2.3	3.0
	3.0				5.0	4.3	4.7
ZW42-68 Bingo	1.5	5.3	7.0	6.0	4.0	2.0	3.0
	3.0				4.3	2.0	5.7
ZW42-69 Loster	1.5	4.0	7.0	6.3	4.3	3.0	3.7
	3.0				5.3	3.3	4.7
Satin	1.5	5.7	7.3	5.3	3.0	1.3	2.7
	3.0				4.3	3.3	5.0
K4-21	1.5	4.7	7.0	6.0	4.3	2.0	3.0
	3.0				5.0	4.0	5.0
K5-29	1.5	3.7	6.7	4.3	2.3	1.3	3.3
	3.0				5.7	3.3	4.3
Longfellow	1.5	5.7	7.0	7.0	6.7	3.3	4.0
	3.0				6.0	4.0	6.0
ST	1.5	7.3	7.3	7.7	5.3	1.7	2.7
	3.0				5.0	2.0	4.3
A-74-50	1.5	4.7	6.3	4.3	3.0	2.0	3.3
	3.0				5.3	4.7	4.7
Menuet	1.5	2.0	7.0	6.3	4.3	1.3	2.7
	3.0				5.3	3.7	5.0
[illegible]ner	1.5	2.7	6.7	6.3	4.3	2.7	3.7
	3.0				5.3	3.0	5.3
Koket	1.5	2.7	6.0	5.3	2.7	1.0	3.0
	3.0				5.3	1.7	4.0

[1]Green-up ratings were made using a scale of 1 to 9, with 9 representing an ideal green.

[2]Quality ratings were made on a scale of 1 to 9, with 9 representing ideal turf.

tion and persistence. The winters of 1977-78 and 1978-79 resulted in near loss of all of the perennial ryegrass trials at our research station. Additional studies have been initiated to identify low temperature hardiness factors involved and what varieties are more tolerant of our winter conditions.

Zoysiagrass is a warm-season species with good low temperature hardiness, disease tolerance, pollution resistance, and low moisture and nitrogen requirements. A representative sample of zoysiagrass varieties have been planted at our experiment station to determine their performance in our region.

Diseases: The incidence of turf disease, enhanced by 27 continuous days of high temperatures and humidity in the Amherst area, was one of the highest noted in recent years. Fairway turfgrass not protected with fungicides appeared to be heavily infected and damaged. It was not uncommon to find 3 or 4 different fungi associated with an infection. However, Brown Patch was found to be most severe and caused considerable damage to turf during the hot spell. An atypical "Brown Patch" disease was also noted infecting grass in the approaches on the Amherst Golf Course. Symptoms of the disease looked somewhat like those caused by Pythium, but still not typical. Incubated infected grass brought out mycelim which was not unlike that of Pythium but a microscopic examination of the mycelium showed that it was not Pythium. The disease was controlled with fungicides that control the Brown Patch organism.

Fungicide for the prevention and control of "Dollar Spot" and "Leaf Spot" were again evaluated on our South Deerfield plots. Results of these tests will appear in the next issue of the Turf Bulletin.

Weed Control: Studies with glyphosate, a non-residual, systemic herbicide, have demonstrated its ability to control creeping bentgrass, tall fescue, quackgrass, and other perennial grasses. However, regrowth from untreated laternal stems and crowns may result in the reinfestation of treated sites. Studies are in progress to evaluate the effects of cultural practices on the competitive ability of quackgrass in Kentucky bluegrass.

Preemergence herbicides differ in their selectivity, efficacy, and persistence. Since custom lawn care services are not always able to apply materials at the optimum time, studies are underway to evaluate the effects of time of application on herbicide efficacy and persistence.

Growth Regulators: A new candidate material, EL-72500, was evaluated for its ability to control vertical growth of a red fescue: Kentucky bluegrass turf. Vertical shoot suppression with minimal injury was achieved, however, time of application is important. Unlike other growth regulators which are foliar absorbed, EL-72500 is a root absorbed material with good residual activity. Additional studies are planned for the future.

Turfgrass Nutrition and Fertilization Practices: Studies being conducted at UMass include the effects of potassium nutrition on environmental stress and summer performance of cool-season turfgrasses. Low temperature studies have shown that perennial ryegrass hardiness is improved when fertilized with an N:K ratio of 2:1 or 3:1. Increased levels of postassium resulted in decreas-

Table 3. Performance of species under low management conditions.

Species	1976	1977 Quality[1]	1978	— 1979 — Quality 5/22	6/19	7/4	Leaf Spot 8/1	6/5
	— Season Averages —							
Kentucky Bluegrass								
Merion	7.0	7.2	5.7	5.9	7.7	7.7	4.0	1.0
Aquila	6.0	7.0	4.7	3.4	4.7	5.3	3.0	3.2
K1-76	5.6	7.3	3.5	2.0	2.0	2.3	1.3	5.0
K1-80	6.5	6.9	2.2	2.5	2.0	2.0	1.7	5.0
K1-155	5.6	6.7	5.3	4.7	5.2	4.7	2.0	1.3
K1-157	7.0	7.3	3.3	3.2	2.7	4.0	2.3	3.0
	6.3	7.1	4.2	3.6	4.1	4.3	2.6	3.1
Red Fescue								
Pennlawn	6.1	5.9	4.5	4.9	4.7	4.7	2.0	2.3
Fortress	6.9	6.1	4.4	5.0	4.7	4.0	2.3	2.0
Marga	4.5	6.8	5.5	6.0	6.2	6.7	1.7	1.3
Mariet	4.5	6.5	5.3	6.2	6.3	6.3	1.3	1.3
Frida	5.4	6.4	4.9	6.0	6.7	6.3	1.3	1.0
Parita	5.2	6.8	5.4	5.2	6.3	7.0	1.7	1.0
	5.4	6.4	5.0	5.6	5.8	5.8	1.7	1.5
Hard Fescue								
Scaldis	3.9	7.1	6.2	7.5	8.0	8.0	4.0	1.2
Centurion	3.8	6.5	5.7	7.7	7.9	7.7	3.7	1.0
Z 2	3.9	6.2	5.1	7.3	6.3	6.3	3.7	1.2
Z 3	3.6	6.3	4.0	4.3	5.3	4.3	2.7	1.0
Trol	3.5	6.0	4.3	5.2	5.0	5.3	2.7	1.0
Pigmee	3.3	5.6	4.3	4.9	5.2	5.3	2.7	1.0
Karlik	3.3	5.2	4.1	4.0	4.5	4.3	2.0	1.3
CLV.3	3.5	5.7	5.0	6.5	6.7	7.0	3.3	1.0
Biljart	4.7	5.8	5.3	6.3	6.0	5.7	3.3	1.0
	3.7	6.0	4.3	6.0	6.1	6.0	3.1	1.1
Perennial Ryegrass								
Manhattan	8.2	6.4	1.3	1.0	1.0	1.7	1.0	1.0
Pennfine	7.8	6.1	3.1	2.5	3.7	1.0	1.0	1.0
	8.0	6.3	2.2	1.8	2.4	1.4	1.0	1.0
Tall Fescue								
'K-31'	6.3	5.8	3.5	3.5	3.0	3.7	1.3	1.8
Canada Bluegrass								
'Reubens'	7.4	6.3	3.3	2.0	1.3	2.7	1.0	1.2

[1]Quality ratings are made on a scale of 1 to 9, with 9 representing ideal turf.
[2]*Helminthosporium* leaf spot ratings were evaluated on a scale of 1 to 5; 1 representing no infection, 2 slight infection, 3-4 moderate infection and 5 severe infection.

ed turfgrass growth and low temperature hardiness. Summer stress may also be reduced by proper potassium nutrition. To determine this, extensive studies have been initiated to study the effects of potassium fertilization on creeping bentgrass summer performance.

Development of slow-release, organic nitrogen fertilizers has been beneficial to turf managers. These materials provide a gradual release of nitrogen for turfgrass growth, thus eliminating the need for frequent applications or the problem of rapid nitrogen release from water-soluble nitrogen fertilizers. However, initial release from slow-release carriers is often inadequate for turfgrass requirements, therefore, requiring addition of a quick release nitrogen source. The purpose of a study in progress is to determine initial and long-term responses of Kentucky bluegrass to 2 formulations each of 3 slow-release nitrogen fertilizers mixed with urea. Presumably, the proper ratio of slow-release; soluble nitrogen fertilizers will provide season-long release of nitrogen in adequate amounts to maintain uniform turfgrass quality.

Cultural Practices: Successful establishment of a seeded turfgrass stand is dependent on proper seedbed prepartion and selection of seed based on seed purity and quality, and species adaptation. In studies initiated to determine the effects of seed purity on turf quality, results indicated that perennial grass seed contaminants including bentgrass, timothy, and orchardgrass adversely affected the physical appearance of the turf. In these studies, bentgrass was extremely competitive and that only a few seeds per 25 sq. ft. of area resulted in poor turfgrass appearance. A more detailed report will be published in a future Turf Bulletin.

Low maintenance lawns are often difficult to maintain on sandy soils due to low moisture availability. In the transition zone, tall fescue has been recommended for home lawns and athletic fields since it produces a tough, deep root system which improves its tolerance to moisture stress and infertile soils. To determine if tall fescue is adapted to similar soil conditions in our region, 'Kentucky-31' tall fescue seeded alone or in mixtures with Kentucky bluegrass are currently being evaluated at mowing heights of 1.5 and 3 inches and at nitrogen rates of 1 and 2 lbs N/1000 sq. ft./yr.

Most lawn turfs are mowed with rotary mowers. One disadvantage to maintaining turf with rotary mowers has been the surface deposition of grass clippings which are too large to readily sift through the verdure to the soil surface. Development of mulching rotary mowers has created interest in their application due to possible advantages of improved turfgrass quality without clipping removal. By macerating clippings, presumably decomposition is more rapid, thus alleviating thatching tendency, and the need for higher fertilization rates to sustain desirable turfgrass quality. While decomposition may be increased, knowledge of the effects mulched clippings return have on turfgrass quality, disease incidence, and thatching tendency have not been documented.

Studies initiated on a Kentucky bluegrass turf to determine the effects of mower types, clipping treatment (mulched, collected, or returned), nitrogen fertilization, and mowing frequency on turfgrass quality indicate that mulching of clippings is beneficial to nitrogen recycling in turf. Where clippings were removed, higher nitrogen fertilization rates were required to maintain turfgrass color and shoot density.

During periods of active growth in the spring and fall, turfgrass quality was reduced in plots mowed with the mulching mower due to surface accumulation of grass clippings in clumps which required a light raking to disperse. Turfgrass quality increased as intervals between mowing decreased, and nitrogen fertilization rates increased for all clipping treatments.

Golf course superintendents are continuously seeking out better adapted grasses for fairways. However, no single species or cultivar is able to adapt itself to the varied soil conditions and microclimates found on many New England golf courses. In the past, mixtures of species were recommended thereby allowing better adapted species to persist and compete under those conditions favoring them. Studies have been initiated to assess the characteristics of a fairway mixture on species adaptaton and persistence under different soil conditions and cultural practices. Presumably, selection of the proper mixture will result in expression of grasses best adapted to the varying fairway conditions, thus, assuring a uniform stand of fairway turf.

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1979 Preemergence Crabgrass Control Trial

Crabgrass (*Digitaria* sp.) is an aggressive warm-season annual that invades turfs thinned or weakened by insects, disease, mechanical injury, and other causes, or where competition by the desired grass is reduced as a result of improper management practices or unfavorable environmental conditions. The use of preemergence herbicides for selective control of crabgrass is an important component of weed control programs. Selection of a herbicide is dependent on turfgrass tolerance, herbicide persistence, and herbicide efficacy; besides cost. The purpose of this study was to evaluate the performance of preemergence herbicides for crabgrass control in Kentucky bluegrass turf.

Preemergence herbicides were applied to an established Kentucky bluegrass turf overseeded with crabgrass. Treatments were made as indicated in Table 1 to 5 by 6 foot plots replicated three times. Plots were mowed 2 or 3 times per week at 1.5 inches and fertilized in April, June, August, and September to supply a total of 4 lbs N/1000 ft²/yr. Treatments were monitored for turfgrass injury and crabgrass germination.

Preemergence crabgrass control with herbicides was good to excellent without herbicide injury with all rates of DCPA, bensulide, siduron, and at 3 lbs/acre benefin applied as single or as split-applications of 1.5 & 1.8 lbs/acre. Prosulfalin provided excellent weed control but resulted in turfgrass injury. Alachlor and oxadiazon provided unacceptable weed control at rates evaluated.

Table 1. Performance of preemergence herbicides for crabgrass control in a Kentucky bluegrass turf.

Treatment	Form[1]	Rate[2] lb ai/a	Turfgrass[3] Injury	Crabgrass[4] cover %	Crabgrass[4] control %
alachlor	15G	1.5	1.0	53	15
		1.5 + 1	1.0	60	21
		2.5	1.0	63	15
benefin	2.5G	1.5	1.0	19	72
		1.5 + 1.5	1.3	9	87
		3	1.0	6	93
bensulide	4E	7.5	10	2	97
		.5 + 7.5	1.0	1	99
		10	1.0	1	99
DCPA	75W	7.5	1.0	1	99
		7.5 + 7.5	1.0	3	94
		10	1.0	0	100
oxadiazon	2G	1.5	1.0	33	54
		1.5 + 1.5	1.3	19	72
		3	1.3	13	83
prosulfalin	50W	1.5	5.7	2	97
		1.5 + 1.5	5.3	0	100
		3	7.7	1	99
siduron	50W	10	1.0	3	96
		10 + 5	1.0	3	96
		15	1.0	4	94
untreated		—	1.0	70	0
LSD 0.05				8	
0.51				14	

[1] Formulations include: granules (G), emulsifiable concentrates (E), and wettable powders (W).
[2] Herbicides were applied May 7 and again June 14, 1979, unless otherwise indicated.
[3] Turfgrass injury was evaluated June 28, 1979, using a scale of 1 through 9, with 1 representing no injury and 9 complete kill of the turf.
[4] Crabgrass cover was visually estimated September 19, 1979.

FROM

Massachusetts Turf and Lawn Grass Council
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