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LAWN INSTITUTE

Harvests

Volume 39 Number 1

THE HARVEST MIX

This issue completes a 10 year series of newsletters which have contained reviews of research on turfgrass and selected talks given at conferences. This has amounted to over 1,000 pages of tabloid and the editors hope that this endeavor has been of value to the readers. The new staff will no doubt take a different direction.

With all best wishes for a successful future in lawn care and turf management"

The Editors

THRESHING THE JOURNALS

Warvests 1

A DECADE OF TURFGRASS

PATHOLOGY AND ENTOMOLOGY RESEARCH

Entomological research reports concerning turfgrasses are published regularly in the following journals:

- Agronomy Journal;
- Annals of the Entomological Society of America;
- Environmental Entomology;
- HortScience;
- Journal of Economic Entomology;
- Journal of Entomological Science;
- The Canadian Entomologist;
- The Coleopterists Bulletin;
- The Great Lakes Entomologist;

Pathological research reports concerning turfgrasses are published regularly in the following journals:

- Agronomy Journal;
- Botanical Gazette;
- Canadian Journal of Botany;
- Canadian Journal of Plant Science;
- Crop Protection;
- Crop Science;
- Hort Science;
- Journal of Nematology;
- Journal of the Sports Turf Research Institute;
- Mycological Research;
- Phytopathology;
- Plant Disease;
- Plant Physiology;
- Soil Biology and Biochemistry;
- Transactions of the British Mycological Society.

The Lawn Institute continually monitors all turfgrass papers published in: Agronomy Journal, Crop Science, HortScience, but has not regularly reviewed research papers in these other publications. In order to more adequately study and evaluate turfgrass insect and disease research reports, 67 contacts were made with leading research entomologists and pathologists requesting reprints of their research papers published during the past decade. Not all responded to this request but those that did presented 24 papers on Turfgrass Entomology and 59 papers on Turfgrass Pathology for review. These 83 papers are featured here under the following headings:

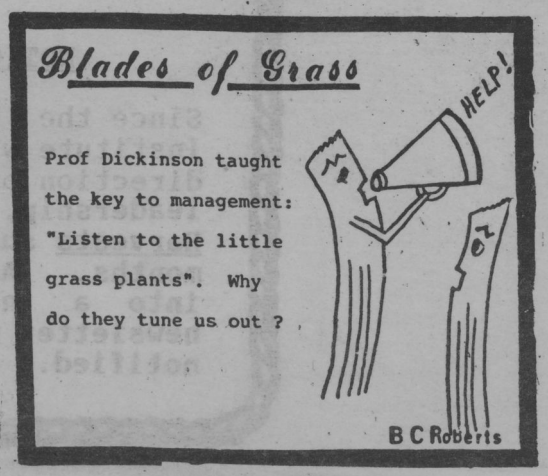
ENTOMOLOGY

- Nontarget Invertebrates
- Thatch Biodegradation Pesticides
- Japanese Beetles
- Milky Disease Bacteria
- Masked Chafers
- Sod Webworms
- Chinch Bugs
- Greenbugs
- Big-eyed Bugs
- Mole Crickets
- Predatory Arthropods
- Other Insect Pests

PATHOLOGY

- Fungicides - Non-Target Effects
- Patch Diseases
- Take-all Patch
- Summer Patch
- Spring Dead Spot
- Rhizoctonia
- Dollar Spot
- Pythium
- Fusarium Blight
- Stripe Smut - Flag Smut
- Yellow Tuft
- Microdochium Nivale
- Gray Snow Mold
- Superficial Fairy Rings
- Root Cortical Death
- Nematodes
- Pathogenicity - Conditions Influencing.

This review illustrates the areas of research emphasis outside of the well publicized testing and evaluation of fungicides and insecticides. Each paper is documented so that it may be studied in its entirely by referring to the original publication.



THRESHING THE JOURNALS continued

NONTARGET INVERTEBRATES

IMPACT OF A HIGH-MAINTENANCE LAWN-CARE PROGRAM ON NONTARGET INVERTEBRATES IN KENTUCKY BLUEGRASS TURF

T B Arnold and D A Potter
Environmental Entomology
Volume 16 Number 1
Pages 100-105
1987

The impact of a high-maintenance program on predators, decomposers, and nontarget herbivorous insects was determined from pitfall-trap collections, soil and thatch extractions and sweep-net and formalin-drench samples. Trap catches of predaceous arthropods, specifically Araneae, Stophylinidae, and Carabidae were significantly reduced by insecticides, particularly late-summer soil treatment with Diazinon. Predators repopulated treated plots by the following spring. Chrysomelidae were more abundant on high-maintenance plots in spring. Soil and thatch pH decreased significantly and thatch accumulation more than tripled under the high maintenance program. However, earthworms were relatively unaffected, and oribatid mites were generally more abundant in high maintenance plots. This suggests that thatch accumulation was probably more a consequence of increased vegetative production than of decreased decomposition due to depletion of soil invertebrates. Although high-maintenance lawn-care programs affect many groups of nontarget invertebrates, this study suggests that the effects are variable and in some cases less severe than would be expected, given the quantity and frequency of pesticide and fertilizer use.

EFFECT OF NITROGEN FERTILIZATION ON EARTHWORM AND MICROARTHROPOD POPULATIONS IN KENTUCKY BLUEGRASS TURF

D A Potter, B L Bridges and F C Gordon
Agronomy Journal
Volume 77, May-June Issue
Pages 367-372
1985

Earthworms and microarthropods are abundant in turfgrass and may be important to thatch decomposition and nutrient recycling. Increasing the rate of nitrogen fertilization resulted in a significant decline in soil and thatch pH and in exchangeable calcium and potassium and caused a significant increase in thatch. A highly significant linear decrease in earthworm density and biomass was noted as annual rates of nitrogen fertilization increased. Collembola were more abundant at an intermediate fertilizer rate, whereas Acaridae were unaffected by nitrogen fertilization. Cyrptostigmata were the most abundant arthropod decomposers in turf. Each of the seven oribatid mite species differed in its response to nitrogen fertilization. The study indicates that when nitrogen fertilizer is applied to Kentucky bluegrass at rates sufficient to cause soil acidification, populations of earthworms and certain other decomposers may be severely reduced. Thatch accumulation was negatively correlated with earthworm density and biomass, although other factors probably also contributed to thatch development.

NOTICE TO HARVESTS SUBSCRIBERS

Since the Headquarters Office of The Lawn Institute will be moving very soon, and the direction of programs may change under new leadership, we have not issued invoices for Harvests subscriptions during the last few months. As soon as the new staff is settled into a new office, the future of the newsletter will be determined and you will be notified. Thank you for your support.

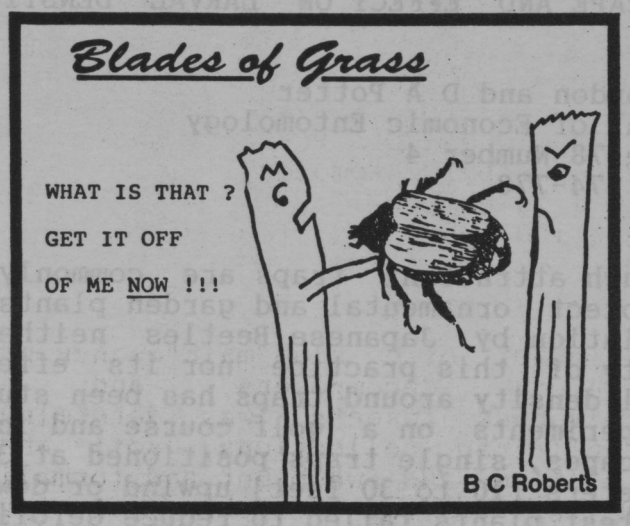
THRESHING THE JOURNALS continued

THATCH - BIODEGRADATION PESTICIDES

PERSISTENCE AND MOBILITY OF ISAZOFOS IN TURFGRASS THATCH AND SOIL

H D Niemczyk and H R Krueger
Journal of Economic Entomology
Volume 80 Number 4
Pages 950-952
1987

The thatch contained 96-99 percent of detectable residues recovered with a range of 0.123 parts per million at 8 weeks to 3.57 parts per million at 3 hours after treatment. Immediate posttreatment irrigation resulted in significantly higher residues in the thatch during the first 2 weeks of sampling. Although useful in moving the insecticide off the grass blades and into the thatch, posttreatment irrigation had no significant effect on movement of the insecticide into the soil.



EVIDENCE OF ENHANCED DEGRADATION OF ISOFENPHOS IN TURFGRASS THATCH AND SOIL

H D Niemczyk and R A Chapman
Journal of Economic Entomology
Volume 80 Number 4
Pages 880-882
1987

Isofenphos disappeared 91-99 percent in 3 days when supernatant from aqueous dispersions of turfgrass thatch and soil in which spring application of isofenphos failed to control summer generation scarabaeid larvae were injected into a solution of 10 parts per million isofenphos. No degradation occurred with samples from an untreated site. The phenomenon of enhanced biodegradation has developed as a result of microorganisms adopting to the presence of a pesticide to the point of being able to use it as a source of energy.

JAPANESE BEETLES

THE INFLUENCE OF APPLICATION TIMING AND POSTTREATMENT IRRIGATION ON THE FATE AND EFFECTIVENESS OF ISOFENPHOS FOR CONTROL OF JAPANESE BEETLE LARVAE IN TURFGRASS

H D Niemczyk
Journal of Economic Entomology
Volume 80 Number 2
Pages 465-470
1987

During 1984 isofenphos resulted in 92 percent average reduction of over-wintered Japanese Beetle larvae 48 days after application in April. Of treatments applied April through August only August applications significantly reduced summer larvae. Residues in samples taken August 6 from April, May, June and July treatments showed that 79,92,94 and 97 percent isofenphos respectively remained in the thatch. Mean oxyisofenphos residues at this time were 54,45,54 and 63 % respectively of total residue. Oxyisofenphos residues 5-6 days after the April 11 and August 14 applications were 7 and 15 percent respectively, of the total. Immediate posttreatment irrigation, plus regular subsequent irrigation and rainfall, did not improve isofenphos penetration into the soil or enhance larva control. larva mortality decreases with increased conversion of isofenphos to oxyisofenphos.

THRESHING THE JOURNALS CONTINUED

EFFICIENCY OF JAPANESE BEETLE TRAPS IN REDUCING DEFOLIATION OF PLANTS IN THE URBAN LANDSCAPE AND EFFECT ON LARVAL DENSITY IN TURF.

F C Gordon and D A Potter
Journal of Economic Entomology
Volume 78 Number 4
Pages 774-778
1985

Although attractant traps are commonly used to protect ornamental and garden plants from defoliation by Japanese Beetles neither the utility of this practice nor its effect on larval density around traps has been studied. In experiments on a golf course and in home landscapes, single traps positioned at 3.1 or 9.3 meters [10 to 30 feet] upwind or downwind from test plants failed to reduce defoliation compared with that which occurred on plants without traps. In fact, defoliation was nearly always greater with the trap present. Japanese Beetle larvae densities were not significantly altered in the vicinity of traps.

JAPANESE BEETLE TRAPS: EVALUATION OF SINGLE AND MULTIPLE ARRANGEMENTS FOR REDUCING DEFOLIATION IN THE URBAN LANDSCAPES

F C Gordon and D A Potter
Journal of Economic Entomology
Volume 79 Number 5
Pages 1381-1384
1986

Single traps, positioned 3.1 meters [10 feet] or 9.3 meters [30 feet] downwind of pin oak trees resulted in significantly greater defoliation than on trees without traps. None of the multiple trap arrangements reduced defoliation and four of the five placements resulted in significantly greater damage than without traps. Use of single Japanese Beetle traps or small scale multiple trap arrangements will not prevent or reduce defoliation of nearby plantings and will probably increase the damage inflicted upon both highly preferred and relatively less attractive hosts.

MILKY DISEASE BACTERIA

PATHOGENICITY OF BACILLUS POPILLIAE AND OTHER MILKY DISEASE BACTERIA IN GRUBS OF THE SOUTHERN MASKED CHAFER

G W Warren and D A Potter
Journal of Economic Entomology
Volume 76 Number 1
Pages 69-73
1983

Virulence of the Cyclocephala strain of Bacillus popilliae in Southern Masked Chafer is comparable to that of Bacillus popilliae type A in the Japanese Beetle. Virulence of 16 other species of strains of milky disease from 15 different hosts was tested via injection in the Southern Masked Chafer. Strains from three Australian Scarabs and a native strain from Phyllophaga fusca were the most infective, producing disease in 36 to 58 percent of the grubs. Failure of sporangia-talc applications to significantly increase milky disease in field tests is attributed to insufficient time for sporangia to have become incorporated into the soil. There was, however, a consistent trend toward increased infection in treated sod.

MASKED CHAFERS

FLIGHT ACTIVITY AND SEX ATTRACTION OF NORTHERN AND SOUTHERN MASKED CHAFERS IN KENTUCKY TURFGRASS

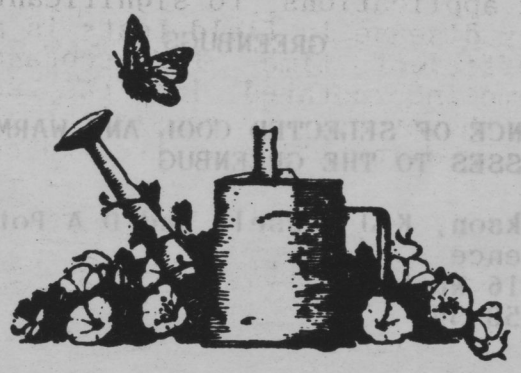
D A Potter
Annals of the Entomological Society of America
Volume 73 Number 4
Pages 414-417
1980

Flight and mating of Southern Masked Chafers begins at dusk and terminates about 2 hours later, while peak activity of Northern Masked Chafers occurs between midnight and 4 AM. Trapping experiments indicated that both females produce a potent volatile sex pheromone which is attractive to males of either species. Previous mating reduced but did not entirely suppress female attractiveness. Female rinses in cyclohexane and ether were effective baits for luring males to traps. Although the 2 species apparently utilize a common airborne sex attractant, they remain reproductively isolated through temporal differences in their mating activity.

INFLUENCE OF FEEDING BY GRUBS OF THE SOUTHERN MASKED CHAFER ON QUALITY AND YIELD OF KENTUCKY BLUEGRASS

D A Potter
Journal of Economic Entomology
Volume 75 Number 1
Pages 21-24
1982

Grubs of the Southern Masked Chafer are serious pests of turfgrass in home lawns, golf courses, parks and other urban areas. On the basis of visual ratings and clipping weights, initial densities of 24 to 48 grubs per 0.1 square meter [1 square foot] caused significant reductions in quality and yield after only 2 weeks, and reduced growth by up to 65 percent after 6 weeks of feeding. Regular irrigation or adequate rainfall masked differences between infested and uninfested plots. Apparently, in many instances, the economic threshhold for Masked Chafer grubs is considerably higher than the usual rule-of-thumb estimate of 6 to 8 grubs per 0.1 square meter [1 square foot].



SEASONAL EMERGENCE AND FLIGHT OF NORTHERN AND SOUTHERN MASKED CHAFERS IN RELATION TO AIR AND SOIL TEMPERATURE AND RAINFALL PATTERNS.

D A Potter
Environmental Entomology
Volume 10 Number 5
Pages 793-797
1981

The temperature threshold for pupation of overwintering Southern Masked Chafer grubs was determined experimentally as 10.8 degrees Centigrade [53.2 degrees Fahrenheit]. Trapping studies during 1979 and 1980 indicated that the first emergence and peak flight of males occur approximately 1 to 2 weeks earlier for the Northern Masked Chafer than for the Southern Masked Chafer. Thermal unit accumulations in air and soil were closely correlated with the first emergence of beetles, but they were less useful for predicting the date of 50 and 90 percent flight. Once emergence has begun, activity of Masked Chafers is more closely related to rainfall patterns than to temperature.

EFFECT OF SOIL MOISTURE ON OVIPOSITION, WATER ABSORPTION, AND SURVIVAL OF SOUTHERN MASKED CHAFER EGGS

D A Potter
Environmental Entomology
Volume 12 Number 4
Pages 1223-1227
1983

Eggs of Cyclocephala immaculata absorb water from the soil, increasing threefold in weight during the first 10 days of embryonic development. Eggs developed normally at soil moistures of12.5 percent and above, but shriveled and died in drier soils. Length of incubation period, survival, and final egg weight did not differ at soil moistures within the range required for survival; however, few eggs were laid in dry soil or when soil moisture approached field capacity. Oviposition in soil moisture gradients indicated that the depth at which eggs are laid can vary in response to moisture levels. Eggs are most susceptible to desiccation when newly laid or close to hatching, but are relatively resistant during the middle stage of development.

SUSCEPTIBILITY OF CYCLOCEPHALA IMMACULATA EGGS AND IMMATURES TO HEAT AND DROUGHT IN TURF GRASS.

D A Potter and F C Gordon
Environmental Entomology
Volume 13 Number 3
Pages 794-799
1984

Eggs of the Southern Masked Chafer are laid under turfgrass in the upper 3 centimeter [1 inch] of soil, where they are vulnerable to heat and desiccation. The ability of eggs to survive periods of drought was found to depend upon egg age, stress duration and temperature. At 25 degrees Centigrade [77 degrees Fahrenheit] the minimum soil moisture level at which eggs developed was between 10.3 and 12.3 percent. Eggs surviving a stress period early in development required several days longer to hatch. In field tests, no eggs survived in desiccated turf, where afternoon soil temperatures exceeded 40 degrees Centigrade [104 degrees Fahrenheit] and soil moisture dropped to less than 8 percent. Egg survival ranged from 55 to 73 percent in irrigated turf.

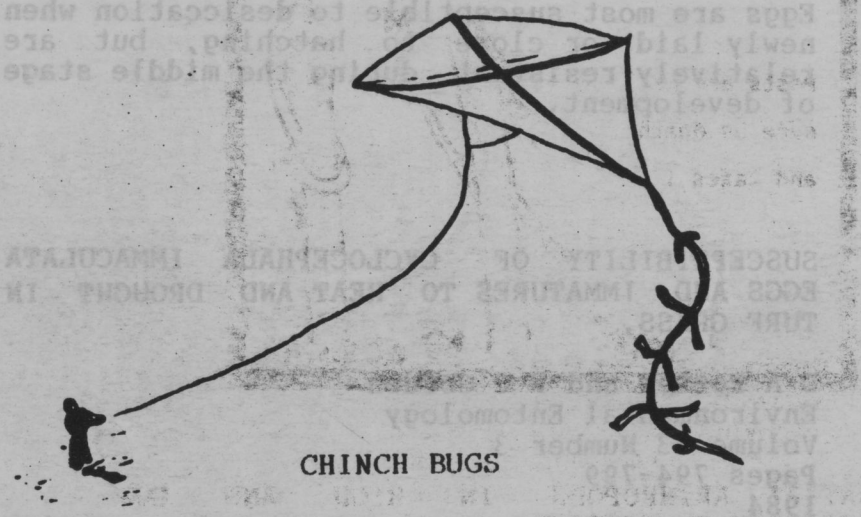
THRESHING THE JOURNALS continued

SOD WEBWORMS

PREDATION ON SOD WEBWORM EGGS AS AFFECTED BY CHLORPYRIFOS APPLICATION TO KENTUCKY BLUEGRASS TURF

S D Cochfield and D A Potter
Journal of Economic Entomology
Volume 77 Number 6
Pages 1542-1544
1984

Predators consumed or carried off up to 75 percent of sod webworm eggs within 48 hours of exposure in turfgrass. One application of Chlorpyrifos applied to Kentucky bluegrass turf reduced the predator-induced mortality of sod webworm eggs for at least 3 weeks after treatment. As evidenced by pitfall traps, the insecticide simultaneously reduced the number of ants and spiders moving through the turf. Ants and mites forage on sod webworm eggs in turf. Four species of mites, five species of Carabidae, five species of Staphylinidae and two other insect species fed on sod webworm eggs in the laboratory.



CHINCH BUGS

PESTICIDE SCREENING TEST FOR THE SOUTHERN CHINCH BUG

R L Crocker and C L Simpson
Journal of Economic Entomology
Volume 74 December issue
Pages 730-731
1981

A filed cage technique for pesticide screening was developed for Blissus insularis in St Augustinegrass in Texas. The method provides reliable results even when large natural populations are not available. With this technique, we are able to make use of a natural population which our presampling had disclosed to be too low and irregularly distributed to be useful in a standard field plot test.

BIOASSAY OF ST AUGUSTINEGRASS LINES FOR RESISTANCE TO SOUTHERN CHINCH BUG AND TO ST AUGUSTINE DECLINE VIRUS

R L Cocker, R W Toler and C L Simpson
Journal of Economic Entomology
volume 75 Number 3
Pages 515-516
1982

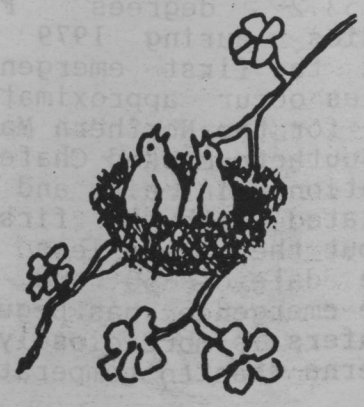
Twelve experimental accessions and the varieties Floratam, Florida common and Texas common St Augustinegrass were bioassayed for resistance to Blissus insularis. Two hybrid accessions, one accession from Africa and Floratam showed combined resistance to Southern Chinch Bug and to St Augustine Decline Virus. Four other hybrid accessions and three accessions from Africa exhibited virus resistance only.

GREENBUGS

RESISTANCE OF SELECTED COOL AND WARM SEASON TURFGRASSES TO THE GREENBUG

D W Jackson, K J Vessels and D A Potter
HortScience
Volume 16 Number 4
Pages 558-559
1981

Three genetically diverse Kentucky bluegrasses - Kenblue, Vantage and Adelphi and 6 other turfgrasses were evaluated for susceptibility to greenbug. Nine common lawn weed species were also tested as potential alternative hosts. Heavy greenbug populations and feeding damage occurred on all 3 bluegrasses and on tall fescue - Kentucky 31 and Chewings fescue - Jamestown. Creeping bentgrass - Penncross, bermudagrass - Midiron, perennial ryegrass - Derby and zoysiagrass - Meyer were not suitable hosts. No greenbugs survived on the 9 weed species tested.



BIG-EYED BUGS

FEEDING NICHES OF THE BIG-EYED BUGS GEOCORIS BULLATUS, G PUNCTIPES AND G ULIGINOSUS

R L Crocker and W H Whitcomb
Environmental Entomology
Volume 9 October issue
Pages 508-513
1980

As opportunistic polyphagous predators, Geocoris species are probably of great importance in the prevention of pest outbreaks in many agricultural, turfgrass and natural habitats. Under natural conditions, these Geocoris species fed on 67 species of small prey from 3 classes of arthropods - Insecta, Arachnida, and Diplopoda. Sessile, ambulatory, saltatory and winged forms, many representing pest species, were successfully attacked.

MOLE CRICKETS

A RATING SYSTEM FOR EVALUATING TAWNY MOLE CRICKET DAMAGE

P P Cobb and T P Mack
Journal of Entomological Science
Volume 24 Number 1
Pages 142-144
1989

Mole cricket abundance as determined from soap flush counts increased with an increase in rating. Cricket damage was rated by visual and touch evaluations of mounds and tunnels. Limitations of the rating system restrict its use to those periods of time when mole crickets are large enough to produce visible mounds and/or tunnels.

PREDATORY ARTHROPODS

SHORT-TERM EFFECTS OF INSECTICIDAL APPLICATIONS ON PREDACEOUS ARTHROPODS AND ORIBATID MITES IN KENTUCKY BLUEGRASS TURF

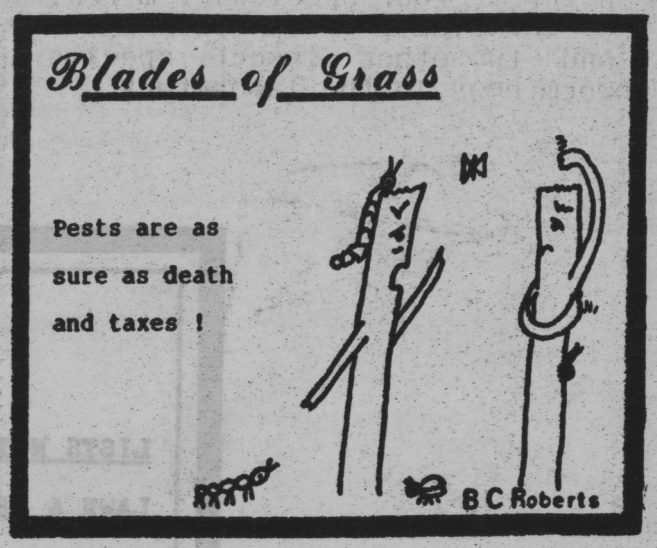
S D Cockfield and D A Potter
Environmental Entomology
Volume 12 Number 4
Pages 1260-1264
1983

Chlorpyrifos and isofenphos had the greatest impact on predaceous arthropods, with some taxa significantly reduced for at least 6 weeks. Effects of Bendiocarb and Trichlorfon were generally less severe and more temporary. Oribatid mite populations were apparently unaffected by the insecticides. Bendiocarb increased trap catches of ants for up to 2 weeks after application.

PREDATORY INSECTS AND SPIDERS FROM SUBURBAN LAWNS IN LEXINGTON KENTUCKY

S D Cockfield and D A Potter
The Great Lakes Entomologist
Pages 179-183
1984

Predatory arthropods were caught in pitfall traps in suburban lawns in Lexington, Kentucky. Nine species of Lycosidae were collected from both bluegrass and tall fescue lawns. More species or phena of Carabidae were collected from bluegrass than from tall fescue turf. More than 40 species or phena of Stophylinids were collected from each grass habitat. Both Kentucky bluegrass and tall fescue are inhabited by an abundant and diverse array of predatory arthropods.



PREDATORY ARTHROPODS IN HIGH AND LOW MAINTENANCE TURFGRASS

S D Cockfield and D A Potter
The Canadian Entomologist
Volume 117 April issue
Pages 423-429
1985

Tall fescue supported fewer predators than Kentucky bluegrass, specially the families Erigonidae, Linyphiidae and Carabidae. Populations of Erigonidae, Linyphiidae and Carabidae were lower in high-maintenance bluegrass than in low-maintenance bluegrass. The Carabids and a Staphylinid were particularly uncommon in high-maintenance sites. Hierarchical classification of sites suggested that the structure of the Staphylinid and Carabid communities differs in tall fescue and Kentucky bluegrass turf and differs in high and low maintenance bluegrass.

THRESHING THE JOURNALS continued

OTHER INSECT PESTS

ANATOMICAL ADAPTATIONS FOR A FOSSORIAL EXISTENCE IN THE STAPHYLINID BEETLE

R L Smith, G C Lanzaro and K G Ross
The Coleopterists Bulletin
Volume 33 Number 4
Pages 439-444
1979

A study of the external anatomy of the Staphylinid Beetle revealed that these animals possess several structural adaptations to fossorial life. These include a nearly cylindrical shape, shortened appendages, expanded digging tibiae, reduced tarsi, mandibles modified for digging and carrying sand grains and setae around the mouth. The oral setae are apparently functional analogs to ammochaetae which occur on certain fossorial ants.

ECOLOGY AND BEHAVIOR OF OSORIUS PLANIFRONS

R L Smith, G C Lanzaro, J E Wheeler and A Snyder
Annals of the Entomological Society of America
Volume 71 Number 5
Pages 752-755
1978

The ecology and behavior of the fossorial Stophylinid Beetle were studied on golf course greens and in the laboratory. Under ideal conditions, they occur in dense aggregations on golf course greens. The life cycle is completed in subterranean galleries, with adults leaving to disperse and mate. In the laboratory the Stophylinid Beetle requires high soil moisture and probably subsists on soil microbes.

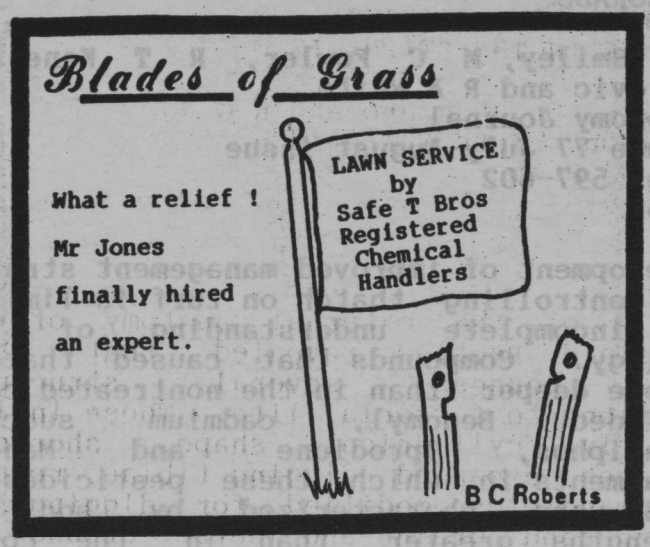
FUNGICIDES NON TARGET EFFECTS

INCREASE IN INCIDENCE AND SEVERITY OF TARGET TURFGRASS DISEASES BY CERTAIN FUNGICIDES

H B Couch and B D Smith
Plant Disease
Volume 75 Number 10
Pages 1064-1067
1991

There has been a significant increase in recent years in the amount of fungicides used in turfgrass culture. Pesticide marketing figures for 1989 show that more fungicide was sold in the United States for use on turfgrass than any other commodity, including various food crops. For United States golf courses, fungicides comprise 48 percent of the total pesticide budget.

Field and laboratory studies were conducted to determine if in a situation of fungicide resistance, the use of the fungicide in question might increase the severity of the target turfgrass disease. Applications of either a mixture of Cycloheximide3 and Thiram or Triphenyltin hydroxide to tall fescue colonized by a strain of Rhizoctonia soloni resistant to these fungicides increased the incidence of Rhizoctonia blight. Applications of Benomyl, Thiophanate-methyl and Thiophanate-ethyl to creeping bentgrass colonized by a Benzimidazole-resistant strain of Sclerotinia homoeocarpa resulted in significant increases in the incidence and severity of Sclerotinia dollar spot. The Benzimidazole-induced increase in dollar spot was detected within 7 days of the second fungicide application and continued for an additional 28 days in the absence of additional fungicide applications. Treatments of creeping bentgrass with Triphenyltin hydroxide also exhibited an increase in dollar spot. This increase was first detected 3 weeks after the third and final fungicide application and continued for 36 days.



OXIDATION STATUS AND GAS COMPOSITION OF WET TURFGRASS THATCH AND SOIL

D C Thompson, R W Smiley and M C Fowler
Agronomy Journal
Volume 75 July-August issue
Pages 603-609
1983

Turfgrasses often develop an organic horizon composed of dead, sclerified, vascular tissue. This thatch horizon is often 1 to 4 centimeters [1/2 to 2 inches] thick and is often underlain by a compacted, poorly drained mineral soil layer. When thatch layers become thick, plant crowns may become elevated into it, and subsequent growth of roots, rhizomes and stolons occurs mostly in the thatch rather than the underlying mineral soil.

Excess thatch in turfgrasses is often associated with decreased plant vigor and increased disease susceptibility. Thatch is the primary rooting medium for many grasses and is a substrate that possesses many prerequisites for anaerobiosis. Conditions of poor oxidation, including low redox potentials and oxygen and carbon dioxide concentrations and accumulations of ethylene were measured in thatch on poorly drained soils. Applications of lime and calcium arsenate amplified the extent of poor oxidation in thatch, whereas calcium nitrate improved the oxidation status. Thatch depth and a coring procedure did not influence thatch oxidation. Poorly oxidized conditions for periods over 7 hours were measured in moist but unsaturated thatch in the field. The temperature of thatch appeared to be important in governing the oxidation status. Phytotoxic products of poorly oxidized environments may accumulate in wet thatch on warm sunny days. These results are relevant to the occurrence of diseases such as Fusarium blight.

FUNGICIDE EFFECTS ON THATCH DEPTH, THATCH DECOMPOSITION RATE AND GROWTH OF KENTUCKY BLUEGRASS

R W Smiley, M C Fowler, R T Kane, A M Petrovic and R A White
Agronomy Journal
Volume 77 July-August issue
Pages 597-602
1985

Development of improved management strategies for controlling thatch on turf is limited by an incomplete understanding of thatch biology. Compounds that caused thatch to become deeper than in the nontreated control included Benomyl, cadmium succinate, Fenamiphos, Iprodione and Mancozeb. Treatments in which these pesticides were used were characterized by sod shear strengths greater than in the control. Thatch accumulations were related mostly to the amounts of roots in the surface 4 centimeters [2 inches]. None of the fungicides studied significantly reduced the apparent rate of thatch decomposition. Fungicides in this study therefore appeared to induce thatchiness in Kentucky bluegrass by increasing the rates of root and rhizome production and not by reducing the rate of litter decomposition.

Seven applications of Benomyl or Iprodione per year caused thatch to become deeper than in untreated turf; however, three applications per years did not. Increased thatch accumulation did not occur with Cyclohexiimide, Metalaxyl, Propiconazol or Triadimefon. None of the fungicides significantly reduced the decomposition rate of buried thatch or altered the thatch pH or microbial composition.

TURFGRASS THATCH COMPONENTS AND DECOMPOSITION RATES IN LONG-TERM FUNGICIDE PLOTS

R W Smiley and M C Fowler
Agronomy Journal
Volume 78 Number 4
Pages 633-636
1986

The balance of organic litter accumulation and decomposition in grasses is determined by complex processes. When routinely treated with certain fungicides, this balance is shifted in favor of accumulatory processes in turfgrasses. Certain fungicides induce thatch accumulation in turf but do not always significantly inhibit or alter the population or composition of the soil microflora. Some fungicides may induce thatch accumulation by increasing the rate of plant tissue production rather than by reducing the rate of litter decomposition.

MICROFLORA OF TURFGRASS TREATED WITH FUNGICIDES

R W Smiley and M M Craven
Soil Biology and Biochemistry
Volume 11
Pages 349-353
1979

Diseases are a constant menace to the maintenance of quality turfgrasses. Frequently, the uncertainties involved with cultural control procedures lead turfgrass managers to rely upon fungicides.

Fungicide use can adversely affect the composition of microbial populations. Combinations of fungicides have been found to suppress fungi and stimulate bacteria and actinomycetes more than individual toxicants. Collective microbial groups were generally less affected by each fungicide than were individual species within each group.

The rate of decrease of ammonia concentrations in fertilized turf [presumably via nitrification] was only slightly influenced by fungicides. The more harmful effects of some fungicides to turfgrass may involve induced acidity rather than direct suppression of specific microbial groups.

NONTARGET EFFECTS OF PESTICIDES ON TURFGRASSES

R W Smiley
Plant Disease
Volume 65 Number 1
Pages 17-23
1981

That pesticides can exert many effects on nontarget organisms and processes in turfgrasses is readily apparent. In addition to direct effects, each chemical and biological change may cause secondary, tertiary and other changes until the entire management program becomes improved or hindered by the use of certain pesticides. The effects may be so slight as to be unnoticeable but large enough to increase expenses for certain management procedures. It can be theorized that frequent use of certain pesticides does alter the long term costs of such management procedures as controlling pests, thatch and soil acidity. These nontarget effects need greater attention in the original decision-making process. If, for instance, four fungicides were known to be almost equally effective against a target pathogen but three were much more likely to increase thatchiness or weediness, the means of selection could be improved. The long-term costs of thatch and weed control are certainly greater than the immediate cost differences among competitively priced fungicides. Although product costs, application costs, technical services provided, immediate availability of a product, and personal preferences are very important considerations, it is also important for scientists to provide additional facts on which to base pesticide-use decisions.

PLANT GROWTH-REGULATING EFFECTS OF SYSTEMIC FUNGICIDES APPLIED TO KENTUCKY BLUEGRASS

R T Kane and R W Smiley
Agronomy Journal
Volume 75 May-June issue
Pages 469-473
1983

Fungicides which exhibit systemic activity in plants often have a high specificity for sites of action and exhibit long term disease control activity. These systemic fungicides are the only compounds that consistently control Fusarium blight, a disease that causes widespread losses to Kentucky bluegrass turfs in North America. Contact protectant fungicides have little or no activity against this disease.

Plant growth retardants have been shown to increase resistance to drought stress, probably by reducing transpiration and/or the water use rate. The reduced metabolic activity of inhibited plants may also affect carbohydrate status, respiration, ion uptake, or other factors. Results of these studies indicate that the systemic fungicides tested have nontarget plant growth regulating effects on Merion and Fylking Kentucky bluegrass seedlings grown under controlled conditions. Preliminary field studies with the same compounds were inconclusive. The growth retarding effects of Pyrimidinemethand and Triazole fungicides may be important influences on plant stress tolerance and resistance to opportunistic pathogens.

FUNGICIDES IN KENTUCKY BLUEGRASS TURF: EFFECTS ON THATCH AND pH

R W Smiley and M M Carven
Agronomy Journal
Volume 70 November-December issue
Pages 1013-1019
1978

Management of thatch and pH are important aspects of turfgrass culture. The use of disease-preventive fungicides is a standard practice on highly maintained turfgrasses, and fungicides may be toxic to many thatch decomposing microorganisms.

The influence of 14 fungicides, one nematicides and of five mixed fungicide programs, applied over a 3 years period, on thatch decomposition and the resultant pH of underlying soil was investigated on a blended Kentucky bluegrass sod. Thatch depths among fungicide treatments ranged from 2.8 to 22.0 millimeters and the pH of the surface 3 centimeters [1 inch] ranged from 5.6 to 6.5. Thatch depth and pH were inversely related - more thatch, lower pH. Fungicide induced reductions in pH occurred to depths exceeding 20 centimeters [8 inches]. Acidification of soil was apparently not the result of organic acids leaching from decomposing thatch but was related to the contributions of sulfur from the fungicides. Oxidation of sulfur from decomposing fungicides reduced the soil pH which, in turn, reduced the activity of microorganisms responsible for degradation of thatch. Thatch accumulation was not considered to be due to inhibitory effects of fungicides toward earthworms.

THREADING THE JOURNALS continued

PATCH DISEASES

TEMPERATURE AND OSMOTIC POTENTIAL EFFECTS OF PHIALOPHORA GRAMINICOLA AND OTHER FUNGI ASSOCIATED WITH PATCH DISEASES OF KENTUCKY BLUEGRASS

R W Smiley, M C Fowler and R T Kane
Phytopathology
Volume 75 Number 10
Pages 1160-1167
1985

Fusarium blight syndrome of Kentucky bluegrass was recently recognized to be a mixture of two or more patch diseases caused by ectotrophic root infecting fungi related to Gaeumannomyces graminis. Two of these ectotrophs are Phialophora graminicola which causes summer patch and Leptosphaeria korrae which causes necrotic ring spot. Several Fusarium fungi are typically the most prevalent when isolated from foliage, crowns and roots of plants expressing symptoms of patch diseases. Temperature and osmotic potential effects on growth and pathogenicity of isolates of these fungi from the United States have been determined. Rapid necrosis of colonized plants occurred only at 29 degrees Centigrade [84 degrees Fahrenheit] and, through a system of elevation in the incubation temperatures, this property has been used to assay the extent of the pathogen's growth through sods at lower temperatures. Susceptibility of plants was more pronounced when plants were mowed at 2 centimeters [1 inch] compared to being unmowed. Leptosphaeria korrae colonized roots but did not affect plant health under conditions examined in this study. Fusarium crookwellense thoroughly colonized and halted further growth by cultures of the other fungi on agar medium, but did not contribute to progress of disease caused by Phialophora graminicola, or to symptom expression on plants colonized by Leptosphaeria korrae.

THE ETIOLOGIC DILEMMA CONCERNING PATCH DISEASES OF BLUEGRASS TURFS

R W Smiley
Plant Disease
Volume 71 Number 9
Pages 774-781
1987

Two popular concepts used for diseases of grasses in North America must be deemphasized. Names of fungal genera should not be used to describe diseases of subterranean or surface-appressed plant parts. Likewise, the "single pathogen for a single disease" concept does not accurately account for successions or complexes of organisms that occur during the process of patch disease development. Disease names become part of the public domain and are not easily, uniformly, or fairly changed if circumstances indicate that isolates of the originally described genus can no longer be considered the primary agent or if the taxonomic assignment of a well-defined agent is changed. Examples of this can be drawn from diseases caused by fungi that were once classified as species of Corticium, Sclerotinia, Helminthosporium and Ophiobolus. These fundamental changes in philosophy will enable much more rapid progress toward understanding and controlling diseases on turfgrasses and toward much higher uniformity in our ability to communicate information about specific diseases.

GARDEN WRITER SURVEY

A survey conducted by Hinsdale Marketing Services for Aquapore Moisture Systems showed that only 14 % of the garden writers who responded were convinced that "products described as environmentally correct were what they claimed to be."

The writers were split on the issue of using terms such as "environmentally correct", "environmentally friendly" or "environmentally preferred" to help sell products.

The garden writers did claim to have a responsibility to inform readers about water conservation and environmental issues.

- Landscape Management
April 1992

THREADING THE JOURNALS continued

GAEUMANNOMYCES INCRUSTANS, A ROOT-INFECTING HYPHOPODIATE FUNGUS FROM GRASS ROOTS IN THE UNITED STATES.

P J Landschoot and N Jackson
Mycological Research
Volume 93 Number 1
Pages 55-58
1989

A root-infecting hyphopodiate fungus with a Philalophora anamorph was isolated from the roots of several turfgrass species in the United States. The teleomorph was produced by crossing opposing mating types on sterile wheat stems. Various root-infecting fungi have received attention for their role in the development of patch diseases of turfgrass.

OCCURRENCE OF GAEUMANNOMYCES PATCH DISEASE IN MARYLAND AND GROWTH AND PATHOGENICITY OF THE CAUSAL AGENT.

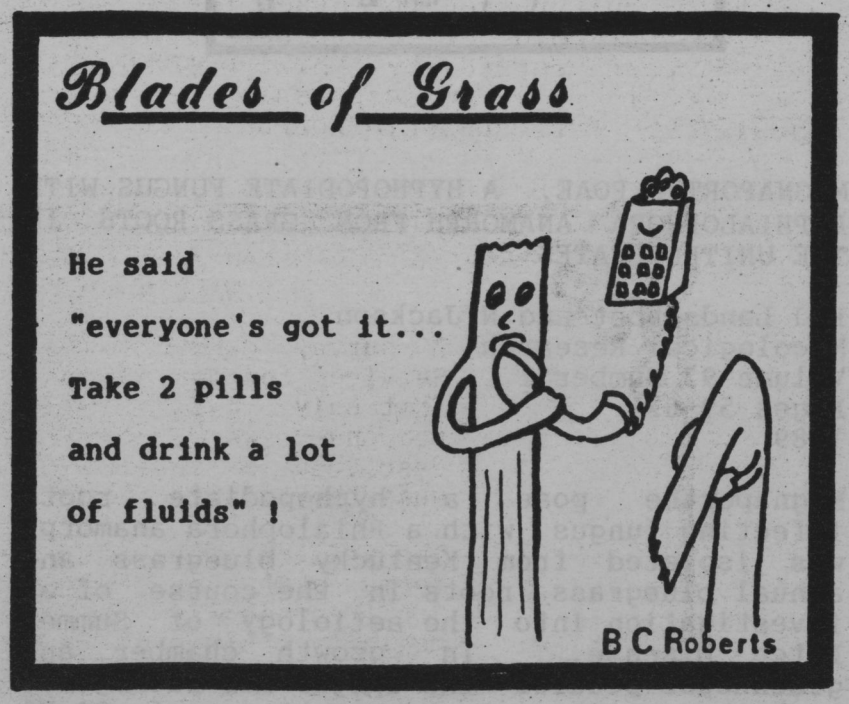
P H Dernoeden and N R O'Neill
Plant Disease
Volume 67 Number 5
Pages 528-532
1983

Gaeumannomyces Patch, formerly known as Ophiobolus Patch is a serious disease of bentgrass turf in many countries. The disease was observed on Penncross creeping bentgrass turf at four locations in Maryland in 1979 and 1980. Affected turf appeared as bronzed, reddish brown or light yellow patches 15-60 centimeters [6-24 inches] in diameter. Dead or thinning turf was observed in the centers of these patches. Dark brown runner hyphae and simple hyphopodia were present on roots, crowns and basal sheaths of diseased plants. Pathogenicity tests showed that seedlings of all bentgrass species used as turf are very susceptible to the disease. Exeter colonial bentgrass seedlings, however, showed a significantly higher level of resistance than Astoria colonial and Penneagle creeping bentgrass.

MANAGEMENT OF TAKE-ALL PATCH OF CREEPING BENTGRASS WITH NITROGEN, SULFUR AND PHENYL MERCURY ACETATE

P H Dernoeden
Plant Disease
Volume 71 Number 3
Pages 226-229
1987

Take-all Patch disease incited by Gaeumannomyces graminis is a destructive disease of bentgrass turf. Ammonium chloride alone and phenyl mercury acetate plus ammonium sulfate effectively controlled the disease in both years of a field study. Ammonium sulfate and urea reduced disease severity to an acceptable level only in the second year. Granular sulfur was ineffective in controlling Take-all Patch. No correlation was found between disease injury and thatch or soil pH. Failure to find a correlation between disease and pH was probably due to the highly buffered nature of thatch and to the use of basic [pH 8.2] irrigation water. Data indicate that treatment effects on thatch and soil pH [pH 6.1-6.8] had no important impact on the disease control observed. Treatments that effectively reduced disease increased thatch biomass, which was attributed to stimulation of plant growth accorded by nitrogen.

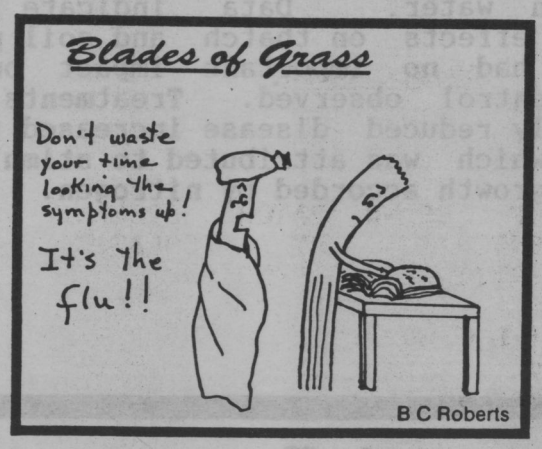


SUMMER PATCH

ARSENATE HERBICIDE STRESS AND INCIDENCE OF SUMMER PATCH ON KENTUCKY BLUEGRASS TURFS

R W Smiley, M C Fowler and R C O'Knefski
Plant Disease
Volume 69 Number 1
Pages 44-48
1985

Investigations were conducted on the relationships between arsenical weed control programs on Kentucky bluegrass and the incidence of Summer Patch caused by Phialophora graminicola. At locations where the disease is likely to occur, applications of calcium arsenate caused extreme amplifications of disease, enough to render it uncontrollable with fungicides. Where the disease is not known to occur, large excesses of arsenate failed to induce new occurrences of Summer Patch. These results seem correlated to soil moisture extremes known to predispose bluegrasses to the disease and to stress caused by arsenicals in the root zones of plants.



MAGNAPORTHE POAE, A HYPHOPODIATE FUNGUS WITH A PHIALOPHORA ANAMORPH FROM GRASS ROOTS IN THE UNITED STATES

P J Landschoot and N Jackson
Mycological Research
Volume 93 Number 1
Pages 59-62
1989

Magnaporthe poae a hyphopodiate root-infecting fungus with a Phialophora anamorph was isolated from Kentucky bluegrass and annual bluegrass roots in the course of an investigation into the aetiology of Summer Patch Disease. In growth chamber and greenhouse studies the fungus was pathogenic to both species at temperatures of 28-30 degrees Centigrade [82-86 degrees Fahrenheit].

TECHNIQUES FOR INDUCING SUMMER PATCH SYMPTOMS ON KENTUCKY BLUEGRASS

R W Smiley and M C Fowler
Plant Disease
Volume 69 Number 6
Pages 482-484
1985

Distinct circular to arc-shaped patch diseases of turfgrasses are caused by soilborne pathogenic fungi that produce darkly pigmented, ectotrophic runner hyphae that spread along roots, rhizomes, and stolons of Gramineae and move from one plant to another. Representative diseases include Take-all Patch of bentgrass and Spring Dead Spot of bermudagrass. Fusarium Blight, also named Fusarium Blight Syndrome is another important diseased characterized by distinct patches.

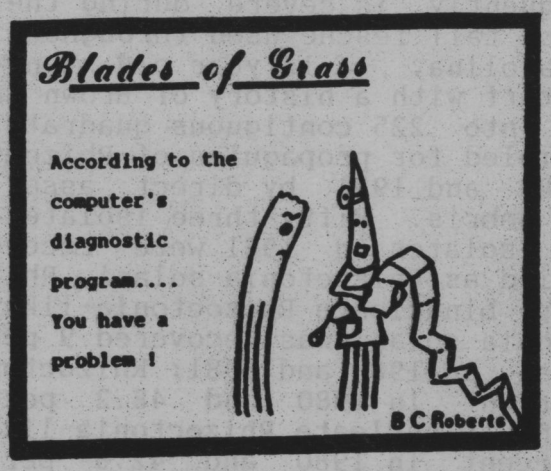
Phialophora graminicola did not induce disease symptoms on sod at 14 degrees Centigrade [57 degrees Fahrenheit] but did so very slowly at 21 degrees Centigrade [70 degrees Fahrenheit] and rapidly at 29 degrees Centigrade [84 degrees Fahrenheit]. The pathogen grew through sods at 21 degrees Centigrade [70 degrees Fahrenheit] but did not kill plants quickly unless the temperature was increased to 29 degrees Centigrade [84 degrees Fahrenheit]. Characteristically pathogens form circular zones of restricted root growth before foliar symptoms are expressed. After the temperature was increased to 30 degrees Centigrade [86 degrees Fahrenheit] the ring [frog-eye] pattern of well-developed or older patches, a sunken-pocket effect and heat-stress banding of leaves on tillers marginally affected by root rot was noted.

SPRING DEAD SPOT

GROWTH AND PATHOGENICITY OF LEPTOSPHAERIA KORRAE IN BERMUDAGRASS

J N Crahay, P H Dernoeden and N R O'Neill
Plant Disease
Volume 72 Number 11
Pages 945-949
1988

Spring Dead Spot is a destructive disease of bermudagrass in North America and Australia. First documentation of symptomatology took place in 1960, but at that time the cause was not determined. Maryland isolates of Leptosphaeria korrae from Tufcote bermudagrass affected with Spring Dead Spot were compared with a New York and a Rhode Island isolate of the fungus from Kentucky bluegrass. Pseudothecia produced on inoculated bermudagrass roots were identical and contained ascospores of similar length for all three isolates, confirming a common identity. The three isolates grew similarly at temperatures ranging from 15 to 30 degrees Centigrade [59 to 86 degrees Fahrenheit] with most rapid growth occurring at 25 degrees Centigrade [77 degrees Fahrenheit]. Tufcote bermudagrass plants inoculated with the Maryland isolate were severely damaged at 15 degrees Centigrade [59 degrees Fahrenheit]. Mortality at 20 degrees Centigrade [68 degrees Fahrenheit] was 44 percent, but at 25 and 30 degrees Centigrade [77 and 86 degrees Fahrenheit] no disease symptoms were visible. The fungus was reisolated from diseased or necrotic plants and greenhouse studies revealed significant differences in isolate virulence and susceptibility of bermudagrass cultivars to disease.



CONTROL OF SPRING DEAD SPOT OF BERMUDAGRASS WITH FUNGICIDES IN NORTH CAROLINA

L T Lucas
Plant Disease
Volume 64 Number 9
Pages 868-870
1980

Spring Dead Spot of bermudagrass was first described in Oklahoma in 1960. The disease occurs in the northern range of bermudagrass adaptation across the southern United States where winter weather is cold enough for periods of dormancy to develop. Spring Dead Spot was controlled with five monthly applications of Benomyl, PCNB, or a combination of fungicides during July-November in 1973 and 1974. Applications of Chloroneb, Nabam, Maneb or Carboxin did not control the disease. The severity of Spring Dead Spot increased in plots without fungicides that received extra nitrogen in August and September.

RHIZOCTONIA

SUPPRESSION OF BROWN PATCH DISEASE OF CREEPING BENTGRASS BY ISOLATES OF NONPATHOGENIC RHIZOCTONIA SPECIES

L L Burpee and L G Goulty
Phytopathology
Volume 74 Number 6
Pages 692-694
1984

Fungi that are similar to Rhizoctonia solani, but have binucleate rather than multinucleate - more than 2 hyphal cells - have been isolated from aerial and subterranean parts of several plant species, including turfgrasses.

Binucleate Rhizoctonia were studied as potential antagonists of Rhizoctonia solani. In each of three field experiments, creeping bentgrass developed significantly less disease when inoculated with binucleate Rhizoctonia 24 hours before inoculation with Rhizoctonia solani than when inoculated with Rhizoctonia solani alone. Disease was not observed in plots inoculated with the binucleate type alone. Significant differences in suppressive ability were observed among binucleate type isolates.

RHIZOCTONIA CEREALIS CAUSES YELLOW PATCH OF TURFGRASSES

L L Burpee
Plant Disease
Volume 64 Number 12
Pages 1114-1116
1980

Isolates of a binucleate Rhizoctonia species that cause chlorosis and blight of turfgrasses fit the species concept of Rhizoctonia cerealis. Mycelial and sclerotial characteristics, temperature-growth relations, and hyphal anastomosis of 10 of these binucleate Rhizoctonia isolates, which had previously been assigned to anastomosis group CAG1 were compared with the characteristics of three isolates of Rhizoctonia cerealis from small grains. The 10 unidentified isolates and the isolates of Rhizoctonia cerealis exhibited similar cultural morphology and were assigned to the common anastomosis group CAG1. Isolates of Rhizoctonia cerealis, thus, are assumed to be the cause of chlorosis and blight of turfgrasses, and the descriptive name "yellow patch" is proposed for the disease caused by Rhizoctonia cerealis on turfgrass species.

A QUALITATIVE BAITING TECHNIQUE FOR SELECTIVE ISOLATION OF RHIZOCTONIA ZEAE FROM SOIL

A S Windham and L T Lucas
Phytopathology
Volume 77 Number 5
Pages 712-714
1987

A baiting technique was developed for selective isolation of Rhizoctonia zeae from naturally infected soil using fungicide-treated stem segments of cotton and a selective medium consisting of 2 percent water agar and Benomyl, Metalaxyl, Penicillin G and Streptomycin sulfate. Cotton stem segments soaked in Benomyl and Metalaxyl, or in Benomyl at double the concentration were successfully used to isolate the fungus from two naturally infected soils. Fungicide-treated stems were colonized in significantly higher numbers than untreated stems. The selective medium also increased recovery of the fungus from colonized stems. Untreated stems were colonized by Rhizoctonia solani, binucleate Rhizoctonia-like fungi, Pythium species and a number of other common soil-inhabiting fungi.

COMPARATIVE SENSITIVITY OF RHIZOCTONIA SOLANI AND RHIZOCTONIA-LIKE FUNGI TO SELECTED FUNGICIDES IN VITRO

S B Martin, L T Lucas and C L Campbell
Phytopathology
Volume 74 Number 7
Pages 778-781
1984

The form-genus Rhizoctonia presently contains nearly 100 species including basidiomycetes, ascomycetes and imperfect fungi. Several of these species have been shown to induce various diseases on turfgrasses and other crops. Benomyl, Carboxin, PCNB, Iprodione, Chlorothalonil, and Triadimefon were added to agar in order to study the inhibition of linear growth of 16 isolates of Rhizoctonia solani, binucleate Rhizoctonia-like fungi and Rhizoctonia zeae from several sources. Rhizoctonia solani and binucleate Rhizoctonia-like fungi were sensitive to Benomyl. Isolates of Rhizoctonia zeae were tolerant to Benomyl but sensitive to other fungicides. Fungi were most sensitive to Iprodione, but growth inhibition in response to other fungicides differed considerably.

HORIZONTAL DISTRIBUTION AND CHARACTERIZATION OF RHIZOCTONIA SPECIES IN TALL FESCUE TURF

S B Martin, C L Campbell and L T Lucas
Phytopathology
Volume 73 Number 7
Pages 1064-1068
1983

Rhizoctonia solani induces Brown Patch, a foliar blight of tall fescue and other turfgrasses. This disease often causes severe damage to cool-season turfgrasses in the warm, humid areas of the United States, and frequently is severe during the summer months on tall fescue used throughout central North Carolina. A 12 year old stand of tall fescue turf with a history of Brown Patch was divided into 225 contiguous quadrats and the soil sampled for propagules of Rhizoctonia in June 1980 and 1981 by direct assay of soil organic debris. Fifty-three isolates in 1980 and 54 isolates in 1981 were recovered and identified as Rhizoctonia solani, Rhizoctonia zeae, or binucleate Rhizoctonia-like fungi. Rhizoctonia solani was recovered 9 percent of the total in 1980 and 1981; Rhizoctonia zeae 45.3 percent in 1980 and 48.2 percent in 1981; and binucleate Rhizoctonia-like fungi 39.6 percent in 1980 and 42.6 percent in 1981. These data indicated that populations of overwintered propagules of Rhizoctonia in tall fescue organic debris are diverse.

PATHOGENICITY OF RHIZOCTONIA ZEAE ON TALL FESCUE AND OTHER TURFGRASSES

S B Martin and L T Lucas
Plant Disease
Volume 67 Number 6
Pages 676-678
1983

Several species of Rhizoctonia are capable of inducing disease on several turfgrass species. Tall fescue, perennial ryegrass, Kentucky bluegrass, creeping bentgrass, common bermudagrass and centipedegrass were inoculated with each of five isolates of Rhizoctonia zeae and one isolate of Rhizoctonia solani. Rhizoctonia zeae isolates blighted cool-season turfgrasses more severely than warm season turfgrasses. Isolates of Rhizoctonia zeae originally obtained from lesions on grasses were more virulent on cool-season grasses than an isolate from corn roots and one from bentgrass affected with a summer dry wilt condition. Isolates of Rhizoctonia zeae were only mildly pathogenic on warm season grasses. The Rhizoctonia solani isolate was more virulent than any of the Rhizoctonia zeae isolates tested.

CHARACTERIZATION AND PATHOGENICITY OF RHIZOCTONIA SPECIES AND BINUCLEATE RHIZOCTONIA-LIKE FUNGI FROM TURFGRASS IN NORTH CAROLINA

S B Martin and L T Lucas
Phytopathology
Volume 74 Number 2
Pages 170-175
1984

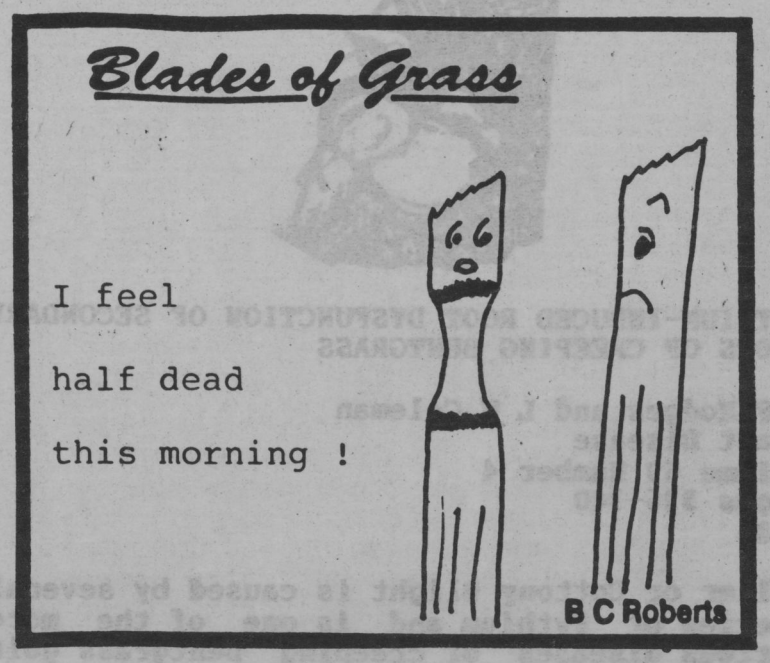
Fungi with mycelium resembling Rhizoctonia solani were described in 1967 and were distinguished by the binucleate condition of hyphal cells in comparison with the multinucleate condition of hyphal cells of Rhizoctonia solani. Most isolates of Rhizoctonia solani induced foliar blight symptoms on cool-season grasses, but in greenhouse inoculations one isolate from symptomatic bermudagrass [Tifton 419] induced a crown rot similar to symptoms observed in the field. Similar inoculations with isolates of Rhizoctonia solani indicated greater virulence on cool-season grasses than warm season grasses with the exception of the bermudagrass crown rotting isolate. Isolates of Rhizoctonia cerealis were obtained during periods of cool damp weather and were associated with a foliar chlorosis of creeping bentgrass. Rhizoctonia zeae was isolated three times from diseased tall fescue and once from creeping bentgrass during hot weather. Isolates of Rhizoctonia zeae were as virulent on tall fescue and Kentucky bluegrass as the Rhizoctonia solani isolates tested in greenhouse experiments under hot weather conditions.

DOLLAR SPOT

EVALUATION OF TWO DOLLAR SPOT FORECASTING SYSTEMS FOR CREEPING BENTGRASS

L L Burpee and L G Goulty
Canadian Journal of Plant Science
Volume 66 April issue
Pages 345-351
1986

Dollar Spot, caused by Lanzia species and/or Maelleradiscus species is a serious disease of turfgrass in cool humid climates. Fungicide programs based on the Hall and Mills and Rothwell [M and R] Dollar Spot forecasting systems for creeping bentgrass were compared with fungicide application schedules of 7,14 and 21 days in 1983 and a schedule of 10 days in 1984. In both years, programs based on the Hall system failed to provide acceptable disease control. Failure of the Hall System was attributed to its ability to predict disease on only 17 percent of the occasions when increases in disease incidence were observed. The M and R system's critical weather criteria, used to select the time for fungicide applications were met on 48 and 35 days in 1983 and 1984, respectively. This over-estimation of disease indicated that the success of the M and R system was a result of prediction frequency and not prediction accuracy..



PYTHIUM

SYNERGISTIC AND ANTAGONISTIC INTERACTIONS OF FUNGICIDES AGAINST PYTHIUM APHANIDERMATUM ON PERENNIAL RYEGRASS

H B Couch and B D Smith
Crop Protection
Volume 10 October issue
Pages 386-390
1991

The increasing use of single-site fungicides and the accompanying reports of resistance on the part of certain of the target organisms to these materials has heightened interest in the development of disease control programs that utilize mixtures of fungicides with different modes of action, but effective against the same pathogen. The Mancozeb plus Chloroneb mixture was antagonistic whereas the combinations of Mancozeb plus Propamocarb, Fosetyl-Al plus Metalaxyl, and Fosetyl-Al plus Propamocarb were synergistic in the control of the Metalazyl-sensitive strain of Pythium aphanidermatum. Mancozeb plus Metalaxyl was synergistic in the control of the Metalaxyl-sensitive and the Metalaxyl-resistant strains. The null hypothesis [additivity] was not rejected for the other combinations. The level of disease control provided by the synergistic combinations tested was equal to or greater than that provided by each of the components applied singly at their full label rates.

PYTHIUM-INDUCED ROOT DYSFUNCTION OF SECONDARY ROOTS OF CREEPING BENTGRASS

C F Hodges and L W Coleman
Plant Disease
Volume 69 Number 4
Pages 336-340
1985

Foliar or Cottony Blight is caused by several species of Pythium and is one of the more serious diseases of creeping bentgrass golf greens. Various Pythium species also are associated with the primary and secondary root systems of creeping bentgrass and other perennial grasses.

New Pythium pathogens have been found associated with secondary roots of creeping bentgrass grown on golf greens with mixtures of high sand content. Some Pythium fungi have been isolated but not found to be pathogenic. Where pathogenic types exist, total shoot and root dry weights of plants decreased in sand and to a lesser extent in sand-loam media. Pathogens develop throughout the cortical and vascular tissues of roots but did not produce lesions or rot. Infected roots occasionally had a light buff coloration. Mycelium was observed in root hairs and infected root tips were bulbous and ultimately devitalized. Sporangia and oospores were rarely observed in infected roots.

FUSARIUM BLIGHT

FUSARIUM BLIGHT AND PHYSICAL, CHEMICAL, AND MICROBIAL PROPERTIES OF KENTUCKY BLUEGRASS SOD

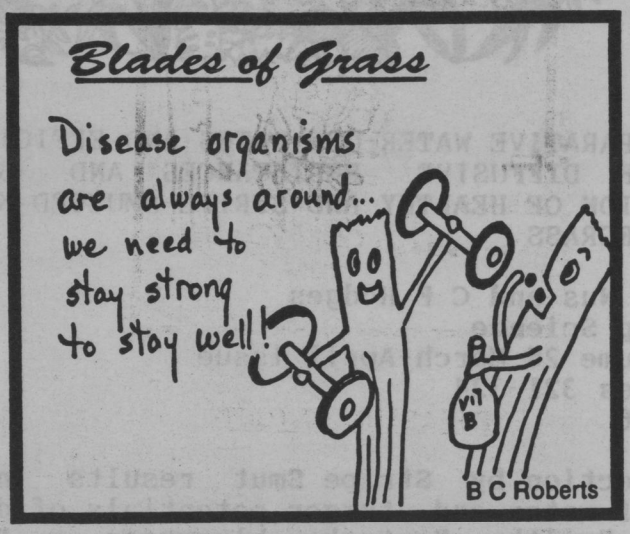
R W Smiley, M M Craven and J A Bruhn
Plant Disease
Volume 64 Number 1
Pages 60-62
1980

Kentucky bluegrass may become severely damaged by Fusarium Blight. The disease was positively correlated with the thatch decomposition rate, negatively correlated with the plant growth variables, and not correlated with any microbial group, including all species, section and composite numbers of Fusarium. Sod pH and Fusarium numbers were associated with thatch decomposition rates. Fusarium Blight was least severe when the percentage of Fusarium-infected plant crowns was highest. These results are considered in relation to the possible role of phytotoxic substances that are produced during thatch decomposition and act as incitants of Fusarium Blight of Kentucky bluegrass.

LEPTOSPHAERIA KORRAE AND PHIALOPHORA GRAMINICOLA ASSOCIATED WITH FUSARIUM BLIGHT SYNDROME OF KENTUCKY BLUEGRASS IN NEW YORK

R W Smiley and M C Fowler
Plant Disease
Volume 68 Number 5
pages 440-442
1984

Kentucky bluegrass is the most important and widely used turfgrass species in temperate regions of North America. Numerous cultivars have resulted from intensive selection and breeding programs. Two fungi with growth habits similar to that of Gaeumannomyces graminis were found to be associated with a patch disease in New York. Both pathogens have been shown capable of causing the disease, which is indistinguishable from the poorly understood Fusarium Blight Syndrome. This is the first report of Leptosphaeria korrae and Phialophora graminicola in North America and of their occurrence on Kentucky bluegrass.



SOIL AND ATMOSPHERIC MOISTURES ASSOCIATED WITH FUSARIUM CROWN ROT AND LEAF BLIGHT OF KENTUCKY BLUEGRASS

R W Smiley and D C Thompson
Plant Disease
Volume 69 Number 4
Pages 294-297
1985

Fusarium species are ubiquitous inhabitants of organic litter [thatch] in Kentucky bluegrass. They become the dominant facultative parasites in thatch during the summer and are therefore likely to become the principal colonists of grasses subjected to stresses at that time. Severity of leaf blight was significantly increased by drought stress, especially when followed by periods of flooding, high humidity or both. Plants that had not been predisposed by drought were resistant to leaf blight even when subsequently flooded but sustained low levels of infection during prolonged periods [up to 8 days] of high relative humidity.

IN VITRO EFFECTS OF FUSARIUM BLIGHT-CONTROLLING FUNGICIDES ON PATHOGENS OF KENTUCKY BLUEGRASS

R W Smiley and M M Craven
Soil Biology and Biochemistry
Volume 11
Pages 365-370
1979

Fusarium Blight of Kentucky bluegrass turf is a crown rot which has been attributed to Fusarium tricinctum and to Fusarium roseum. Although these Fusaria can easily infect leaves under glasshouse conditions, and are nearly always associated with both healthy and diseased turfgrasses, the field symptoms of this disease have only once been artificially induced in the glasshouse with inocula of Fusarium. The etiology of Fusarium Blight remains to be clarified.

An experimental Iprodione fungicide controls Fusarium Blight of Kentucky bluegrass, but it also amplifies the proportion of crowns colonized by Fusarium and the number of its propagules in the soil. In contrast, the disease, the proportion of infected crowns and the numbers of propagules in soil are generally suppressed by Benomyl. Triadimefon also controls the disease but is not stimulatory or inhibitory of Fusaria.

These investigations with selective fungicides indicate that the primary causal agent of Fusarium Blight is not among the Fusaria and that re-interpretation of the disease and its etiology is necessary.

FUSARIUM SPECIES IN SOIL, THATCH AND CROWNS OF KENTUCKY BLUEGRASS TURFGRASS TREATED WITH FUNGICIDES

R W Smiley and M M Craven
Soil Biology and Biochemistry
Volume 11
Pages 355-363
1979

Little information exists concerning the effects of long-term fungicide programs on the qualitative and quantitative characteristics of Fusaria in turfgrasses and in turfgrass soils. These effects were studied on Kentucky bluegrass turfgrasses at three locations using 14 fungicides, one nematicide and five mixed fungicide programs. Some fungicides increased the numbers of Fusaria in soil and thatch; some had no effect; and others greatly reduced the numbers. Changes in fusarium species compositions occurred independently from the changes in propagule numbers. The proportion of Fusarium-colonized turfgrass crowns was generally higher in fungicide treated than in non-treated turfgrasses.

THRESHING THE JOURNALS continued

STRIPE SMUT - FLAG SMUT

LEAF AND ROOT GROWTH OF WATER-STRESSED KENTUCKY BLUEGRASS INFECTED BY USTILAGO STRIIFORMIS OR UROCYSTIS AGROPYRI

J L Nus and C F Hodges
Crop Science
Volume 25 January-February issue
Pages 97-101
1985

The relative growth of the shoot vs roots has proven to be a useful parameter in investigations of drought tolerance. In addition, overall plant growth has been used as a measure of tolerance to water stress. Kentucky bluegrass infected with Stripe Smut or Flag Smut exhibits greater mortality than healthy plants during periods of water stress and is suggestive of decreased drought tolerance as a result of infection.

Infection of Stripe Smut increased total and leaf dry weight and decreased root weight and root-shoot ratios of plants grown in nutrient solution. Plants infected by flag Smut exhibited decreased total, leaf and root weights and root-shoot ratios. Total, leaf and root weights of healthy, Stripe Smut and Flag Smut infected plants decreased and root-shoot ratios increased with decreasing osmotic potentials of nutrient solutions. The increases in total and leaf weights of Stripe Smut infected plants compared with healthy plants grown in nutrient solution were lost as osmotic potentials decreased. Healthy plants maintained higher root-shoot ratios than infected plants at all stress levels. The decreases in root-shoot ratios of infected plants represent a morphological basis for reduced stress tolerance and subsequent increased mortality of infected plants during periods of water stress.

EFFECT OF WATER STRESS AND INFECTION BY USTILAGO STRIIFORMIS OR UROCYSTIS AGROPYRI ON LEAF TURGOR AND WATER POTENTIALS OF KENTUCKY BLUEGRASS

J L Nus and C F Hodges
Crop Science
Volume 25 March-April issue
Pages 322-326
1985

Plant tolerance to water stress can be measured, in part, by calculating the plants ability to maintain turgor during periods of water stress. Kentucky bluegrass systemically infected by either Stripe Smut or Flag Smut exhibits greater mortality than noninfected plants during periods of water stress suggesting decreased drought tolerance with infection. Infection by either pathogen decreased leaf turgor and water potentials during light and dark periods as compared with noninfected controls. In addition, noninfected plants maintained higher leaf turgor and water potentials than infected plants as nutrient solution osmotic potentials were lowered with polyethylene glycol. Water stress lowered leaf osmotic potentials and relative water contents at zero turgor and decreased the turgid weight/dry weight ratios of noninfected and infected leaves. Noninfected plants exhibited lower osmotic potentials at zero turgor and maintained smaller turgid weight/dry weight ratios after water stress than infected plants, suggesting that infection by either pathogen inhibited osmotic adjustment and cell wall thickening in leaves of Kentucky bluegrass in response to water stress.

COMPARATIVE WATER-USE RATES AND EFFICIENCIES, LEAF DIFFUSIVE RESISTANCES AND STOMATAL ACTION OF HEALTHY AND STRIPE-SMUTTED KENTUCKY BLUEGRASS

J L Nus and C F Hodges
Crop Science
Volume 26 March-April issue
Pages 321-324
1986

Infection by Stripe Smut results in lower leaf-water and turgor potentials of diseased vs healthy Kentucky bluegrass. Pathogen induced water stress is common in diseased plants and may result from a number of factors. Water uptake may be limited by pathogen induced root growth inhibition or vascular blockages. Pathogen induced water stress may arise, in part, from increases in host transpiration due to decreases in cuticular resistance or an inhibition of stomatal movement.

Leaves of Merion Kentucky bluegrass infected with Stripe Smut with immature sori and no visible rupturing of the epidermis did not differ in water use rate or in water use efficiency from healthy plants. Leaves of infected plants with mature sori and moderate to heavy sporulation and subsequent epidermal damage showed sharp decreases in water use rate and water use efficiency compared with healthy plants or infected leaves with immature sori and a visibly intact epidermis. Stomatal closure on infected leaves with immature sori occurred at lower leaf water potentials than on healthy leaves, suggesting a degree of osmotic adjustment in response to pathogen induced water stress.

TEMPERATURE AND THE CONTENT OF SPECIFIC SOLUBLE SUGARS OF KENTUCKY BLUEGRASS INFECTED BY USTILAGO STRIIFORMIS OR UROCYSTIS AGROPYRI

J P Madsen, C F Hodges and J L Nus
Botanical Gazette
Volume 144 Number 3
Pages 407-411
1983

Plants of Merion Kentucky bluegrass that are systemically infected with Stripe Smut or by Flag Smut are readily killed by high temperature and drought. Irrigation of infected plants throughout the high temperature and dry periods of the summer substantially reduces the death of Stripe Smut infected plants but only slightly reduces the death of Flag Smut infected plants. Survival of Stripe Smut infected plants under irrigation is a primary contributing factor to the perennial nature of the pathogen in infected plants and to development of epiphytotics in managed turf.

The mean total soluble sugar content of sucrose, glucose and fructose of Kentucky bluegrasss infected by Stripe Smut or by Flag Smut was determined at 10,20 and 30 degrees Centigrade [50, 68 and 86 degrees Fahrenheit]. Sugar content of healthy plants was greatest at 20 degrees Centigrade [68 degrees Fahrenheit], intermediate at 10 degrees Centigrade [50 degrees Fahrenheit] and lowest at 30 degrees Centigrade [86 degrees Fahrenheit]. Sucrose was most abundant at all temperatures. Sucrose and glucose were most evenly distributed among leaves, crowns, roots and rhizomes at 20 degrees Centigrade [68 degrees Fahrenheit]. The greater proportion of sucrose and glucose was in leaves at 10 and 30 degrees Centigrade [50 and 86 degrees Fahrenheit]. Fructose was very low in healthy plants at 30 degrees Centigrade [86 degrees Fahrenheit]. Plants infected with Stripe Smut or by flag Smut showed a substantial decrease in mean total sugar content at all temperatures. The decrease in sugars induced by Flag Smut was greater than that caused by Stripe Smut at 10 and 20 degrees Centigrade [50 and 68 degrees Fahrenheit].

RESIDUAL STRIPE SMUT CONTROL IN KENTUCKY BLUEGRASS WITH REDUCED FUNGICIDE LEVELS

P H Dernoeden
HortScience
Volume 24 Number 5
Pages 796-798
1989

Stripe Smut is a destructive disease of Merion and several other cultivars of Kentucky bluegrass. Stripe Smut infection can result in severe injury when turf is subjected to drought stress, and may be enhanced under high nitrogen alone or high nitrogen plus low phosphorus and potassium fertility. Fungicides were foliar-applied to a diseased stand of Merion Kentucky bluegrass in spring while disease symptoms were evident. Sequentially applied [14 day interval] of Triadimefon and Terbuconazole provided excellent control and commercially acceptable turfgrass quality. Propiconazole also provided good disease control. Observations and data collected over three years do not support the view that Stripe Smut infected plants die during summer stress periods, thereby controlling the disease by reducing large populations of perennially infected plants.

YELLOW TUFT

MANAGING YELLOW TUFT DISEASE

P H Dernoeden and N Jackson
Journal of the Sports Turf Research Institute
Volume 56
Pages 9-17
1980

Yellow Tuft disease of turfgrass is caused by a downy mildew fungus. Severe infection mars the appearance and playability of putting surfaces and may render Kentucky bluegrass sod temporarily unsalable. Application of six nitrogenous fertilizers reduced the intensity of Yellow Tuft disease symptoms in a heavily infected Jamestown Chewings fescue, Kingstown velvet bentgrass sward. Reduction of disease symptoms by the fertilizers was ascribed to improved color and density afforded by nitrogen. Nutrients applied to a sand medium supporting plants infected with Scleropthora macrospora enhanced the spore producing capacity of the mycelium contained within these plants. Fertilizers, therefore, masked disease symptoms, but did not cure the disease. The fungicide Subdue or Ridomil arrested any further mycelial colonization of developing leaves and rhizomes from crowns of infected Kentucky bluegrass plants.

Jamestown Chewings fescue plants infected with Yellow Tuft persisted for a minimum of two years. Developing axillary buds can escape systemic invasion of mycelium from infected crowns and eventually those downy mildew free tillers may replace the original diseased plant. This may account for the ephemeral nature of this disease.

THREshing THE JOURNALS continued

MICRODOCHIUM NIVALE

VARIATION AMONG ISOLATES OF MICRODOCHIUM NIVALE COLLECTED FROM WHEAT AND TURFGRASSES

L Litschko and L L Burpee
Transactions of the British Mycological Society
Volume 89 Number 2
Pages 252-256
1987

Isolates of Microdochium nivale collected from turfgrasses in southern Ontario could not be differentiated from isolates collected from winter wheat on the basis of conidial morphology, conidiogenesis, response in vitro to several fungicides, growth at 10 or 20 degrees Centigrade [50 or 68 degrees Fahrenheit] or asexual compatibility among thalli. Four isolates from wheat produced perithecia homothallically. Isolates from turfgrasses produced perithecia only when paired with other isolates from turfgrass or wheat.

GRAY SNOW MOLD

SUPPRESSION OF GRAY SNOW MOLD ON CREEPING BENTGRASS BY AN ISOLATE OF TYPHULA PHACORRHIZA

L L Burpee, L M Kaye, L G Goulty and M B Lawton
Plant Disease
Volume 71 Number 1
Pages 97-100
1987

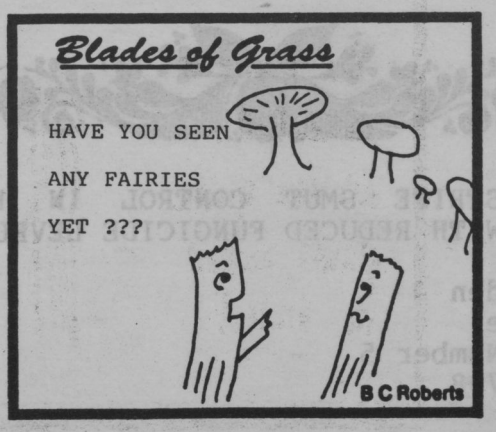
At least six species of low temperature-tolerant plant pathogenic fungi incite snow mold diseases of turfgrasses in cool, humid and cool, subhumid climates. Field studies were conducted in 1983 and 1984 to determine the effects of Typhula isolates alone and in combination on creeping bentgrass. Isolate T011 was nonpathogenic; isolate T004 caused Foliar Blight and Crown Decay. Significantly less foliar necrosis was observed on bentgrass inoculated with a combination of isolates T011 and T004 than on bentgrass inoculated with isolate T004 alone. Sections of a creeping bentgrass golf green with a history of infection by Typhula ishikariensis showed 44 and 70 percent less Gray Snow Mold when infested with wheat grain inoculum of Typhula phacorrhiza in 1983 and 1984, respectively.

SUPERFICIAL FAIRY RINGS

EFFECT OF FUNGICIDES ON THE OCCURRENCE AND GROWTH IN VITRO OF BASIDIOMYCETES ASSOCIATED WITH SUPERFICIAL FAIRY RINGS IN CREEPING BENTGRASS

K E Kackley, P H Dernoeden and A P Grybauskas
Plant Disease
Volume 73 Number 2
Pages 127-130
1989

Superficial fairy rings in turf are incited by numerous thatch-inhabiting Basidiomycetes. The term superficial fairy ring was first used in 1981 to identify the diverse group of diseases also described in the literature as white patch, superficial white patch or rings or simply as circular patches. A majority of the causal fungi remain unidentified. The appearance of superficial fairy rings has previously been associated with the use of Benomyl. It also develops in the absence of fungicide use. Two isolates of Basidiomycetes exhibiting similar colony characteristics and temperature optima for growth were obtained from fairy rings where Benomyl was either not used or was used extensively. Growth of the isolates was not stimulated by incubation at 25 degrees Centigrade [77 degrees Fahrenheit]. Observations of growth in vitro and in the field do not support the premise that Benomyl predisposes turf to Fairy Ring by stimulating mycelial growth.



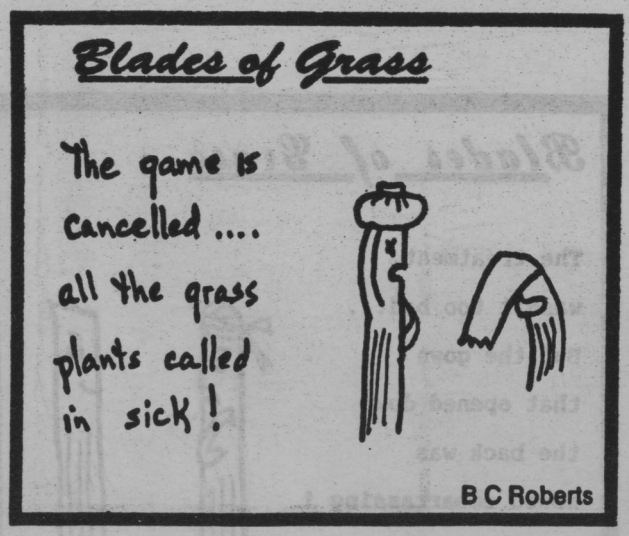
ROOT CORTICAL DEATH

ROOT CORTICAL DEATH IN RELATION TO INFECTION OF Kentucky BLUEGRASS BY PHIALOPHORA GRAMINICOLA

R W Smiley and D E Giblin
Phytopathology
Volume 76 Number 9
Pages 917-922
1986

Nonpathogenic lysis of nuclei in the cortex cells of roots has been termed root cortical death. The natural senescence in root cortices and root cortical death is a highly regulated process, occurring first in the epidermal layer, then continuing, one cortical layer at a time, toward the endodermis. Numbers of dead cortical cells increase with increasing distance from the root apex, but cells of the innermost cortical layer and the endodermis often retain their nuclei much longer than cells of the epidermis and outer and middle cortex.

Adelphi, Merion, Nassau and Nugget Kentucky bluegrasses were examined for influence of temperature and shading on natural autolysis of nuclei in root cortex cells, a process called Root Cortical Death. Higher temperatures increased the magnitude of Root Cortical Death and shading reduced the rate of anucleation in the presence of the root-infecting pathogen Phialophora graminicola. Root Cortical Death assessments in Kentucky bluegrasses may be useful in breeding and selecting cultivars with improved resistances to root pathogens and environmental stresses.



NEMATODES

POPULATION DYNAMICS OF BELONOLAIMUS LONGICANDATUS AND CRICONEMELLA ORNATA AND GROWTH RESPONSE OF BERMUDAGRASS AND OVERSEEDED GRASSES ON GOLF GREENS FOLLOWING TREATMENT WITH NEMATICIDES

L T Lucas
Journal of Nematology
Volume 14 Number 3
Pages 358-363
1982

Belonolaimus longicaudatus has been associated with severe damage on bermudagrass in sandy soils of the Southeastern United States, and nematicides are often needed to grow good quality turf when this nematode is present. Improvements in turf quality were observed within 4 weeks after treatment with Phenamiphos and Fensulfothion. These two nematicides varied in reduction of nematodes depending on specific nematode, time following treatment and time of year. The percent area covered by prostrate spurge the year following treatment was reduced with Phenamiphos, but not with Fensulfothion.

PATHOGENICITY - CONDITIONS INFLUENCING

PATHOGENICITY OF SOME SELECT SOILBORNE DEMATIACEOUS HYPTOMYCETES ON GERMINATING SEED OF RED FESCUE

J P Madsen and C F Hodges
Phytopathology
Volume 70 Number 1
Pages 21-25
1980

Seed inoculation and soil and seed infestation methods with Drechslera sorokiniana reduced the amount and rate of seedling emergence and increased seedling mortality. Curvularia genicularia reduced seedling emergence, but had no effect on rate of emergence or on seedling mortality. Pathogenicity of both organisms was greater in autoclaved soil than in nonautoclaved soil. Seedling emergence in soil infested with the combination of both fungi was greater than that in response to either organism alone which suggests competition between the organisms in the soil environment. A synergistic pathogenic interaction between the organisms is suggested.

INFLUENCE OF PREEMERGENCE HERBICIDES ON PATHOGENESIS BY DRECHSLERA SOROKINIANA ON SEQUENTIALLY SENESCENT LEAVES OF KENTUCKY BLUEGRASS

C F Hodges
Canadian Journal of Botany
Volume 60
Pages 186-190
1982

Preemergence herbicides, Benefin, Bensulide, DCPA and Siduron, stimulated, had no effect on, or inhibited Leaf Spot on shoot leaves of various ages. Stimulation of Leaf Spot primarily occurred on the two youngest visible leaves of the shoot and was induced by Bensulide and DCPA. Benefin and Siduron had no effect on Leaf Spot development on the two youngest leaves and none of the herbicides inhibited Leaf Spot on the two youngest leaves. The various herbicides were primarily inhibitory of Leaf Spot development on the two oldest leaves of the shoot.

PREEMERGENCE HERBICIDES AND THE SEVERITY OF LEAF SPOT CAUSED BY DRECHSLERA SOROKINIANA ON KENTUCKY BLUEGRASS

C F Hodges
Phytopathology
Volume 71 Number 7
Pages 720-722
1981

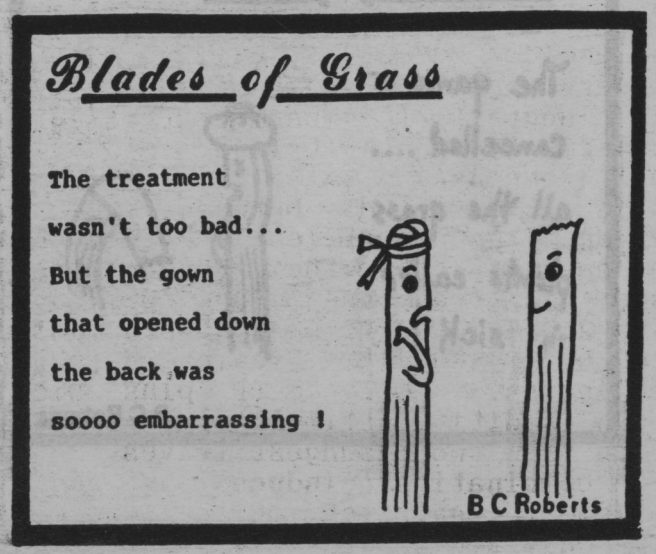
The ability of herbicides to stimulate or inhibit diseases induced by fungal pathogens is well documented. The Leaf Spot induced in Kentucky bluegrass generally is stimulated by auxin-like postemergent herbicides 2,4-D, 2,4,5-T, MCPP and Dicamba. The stimulation is associated with an interaction between the herbicides and sequential leaf senescence that enhances pathogenesis on each older leaf.

Four preemergence herbicides, Benefin, Bensulide, DCPA and Siduron, were evaluated for effect on the severity of Leaf Spot on Kentucky bluegrass. The results suggest that, except for Benefin and Bensulide stimulation or inhibition of Leaf Spot by preemergence herbicides is concentration specific.

INTERACTION OF SEQUENTIAL LEAF SENESCENCE OF KENTUCKY BLUEGRASS AND PATHOGENESIS BY DRECHSLERA SOROKINIANA AS INFLUENCED BY POSTEMERGENT HERBICIDES

C F Hodges
Phytopathology
Volume 70 Number 7
Pages 628-630
1980

Leaf Spot on Kentucky bluegrass is chronic throughout the growing season and numerous cultural practices influence disease development. The influence of four chorophenoxy - 2,4-D, 2,4,5-T, 2,4,5-TP, MCPP - and one benzoic acid - Dicamba - postemergent herbicides on pathogenesis by Drechslera sorokiniana on progressively older leaves of Kentucky bluegrass was determined. Disease increased on each successively older leaf of untreated control plants and a direct relationship was established between increasing leaf senescence and pathogenesis. The soil drench application of 2,4-D and the spray and soil-drench application of 2,4,5 T, MCPP and Dicamba increased the level of disease on leaves of all ages above that of the controls and on each older leaf of the plants in the respective treatments. Extensive chlorosis and straw-colored blighting was associated with pathogenesis on the two oldest leaves of shoots exposed to 2,4,5-T, MCPP and Dicamba and was suggestive of premature leaf senescence. It was hypothesized that the increase in pathogenesis on progressively older leaves of plants exposed to auxin like herbicides is the function of a host-pathogen herbicide interaction that enhances the rate of sequential leaf senescence.



SOLUBLE SUGARS AND FREE AMINO ACIDS OF KENTUCKY BLUEGRASS EXPOSED TO CHLOROPHENOXY HERBICIDES AND PATHOGENESIS BY DRECHSLERA SOROKINIANA

J P Madsen and C F Hodges
Phytopathology
Volume 73 Number 5
Pages 737-740
1983

Leaf Spot of Kentucky bluegrass caused by Drechslera sorokiniana [Helminthosporium sativum P K and B] is influenced by cultural practices such as nitrogen fertilization and mowing height and by such environmental factors as light and temperature. The influence was evaluated of two postemergence herbicides, MCPP and 2,4,5-TP, on total and individual soluble sugars and free amino acids of leaves of herbicide tolerant Kentucky bluegrass and on the severity of Leaf Spot.

The incidence of Leaf Spot on plants growing in soil treated with MCPP was more severe than Leaf Spot of the untreated controls. 2,4,5-TP had no influence on the severity of the Leaf Spot. Leaves of plants growing in soil treated with either herbicide had lower sucrose and total soluble sugar amounts than did control leaves. The decrease in sucrose and total soluble sugars in uninoculated leaves of herbicide-treated plants was significantly correlated with increased Leaf Spot severity of inoculated leaves of herbicide treated plants.

DEVELOPMENT OF DRECHSLERA SOROKINIANA ON SEQUENTIALLY SENESCENT LEAVES OF KENTUCKY BLUEGRASS EXPOSED TO POSTEMERGENCE HERBICIDE COMBINATIONS

C F Hodges
Plant Disease
Volume 68 Number 3
Pages 213-215
1984

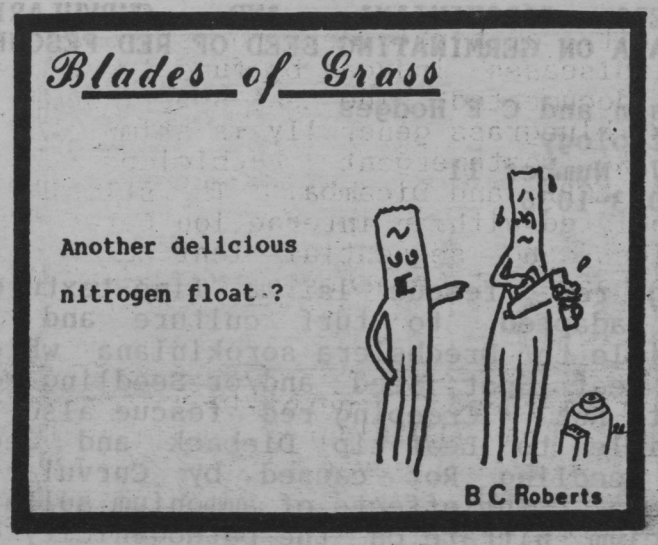
Combinations of 2,4-D, 2,4,5-TP, MCPP and Dicamba were applied as soil drenches to Kentucky bluegrass to determine their effect on development of Drechslera sorokiniana. Disease response to the herbicide combinations differed between the two youngest and two oldest leaves of the shoot. Disease severity on the youngest leaves decreased in response to combinations including 2,4,5-TP. Disease development was inhibited by 2,4-D plus Dicamba on the two youngest leaves. Only MCPP plus Dicamba showed on additive stimulatory effect on disease on the two youngest leaves. Most herbicide combinations induced an additive stimulation of Leaf Spot on the two oldest leaves. Only 2,4-D plus 2,4,5-TP on leaf 3 and MCPP plus Dicamba on leaves 3 and 4 failed to stimulate disease additively.

NITROGEN-INDUCED CHANGES IN THE SUGARS AND AMINO ACIDS OF SEQUENTIALLY SENESCING LEAVES OF KENTUCKY BLUEGRASS AND PATHOGENESIS BY DRECHSLERA SOROKINIANA

P W Robinson and C F Hodges
Phytopathology Z
Volume 101
Pages 348-361
1981

The effect of ammonium nitrate on the soluble sugar and free amino acid content of sequentially developing and senescing leaves of Kentucky bluegrass was determined and evaluated relative to pathogenesis by Drechslera sorokiniana. Ammonium nitrate induced a differential redistribution of soluble sugars in leaves of different ages. Total sugars [fructose, glucose, sucrose, raffinose] increased in the two youngest leaves of the shoot and decreased in the two oldest leaves. Total free amino acids increased significantly only in leaf three [leaf 1 youngest and leaf 4 oldest] in response to ammonium nitrate.

Leaves 2 and 3 were most responsive to pre and post infection development of Drechslera sorokiniana on ammonium nitrate treated plants. These observations suggest that the "high-low" sugar concept of plant disease must be differentially applied to sequentially developing and senescing leaves and that cultural factors [nitrogen fertilization] may further modify such interactions. The results also suggest that the amino acid pool may have a greater influence on the preinfection germination and growth of conidia on the leaf surface than that of sugars.



EFFECT OF CHLOROPHENOXY HERBICIDES ON FREE AMINO ACIDS IN SEQUENTIALLY SENESCENT LEAVES OF KENTUCKY BLUEGRASS AND ON PATHOGENESIS BY BIPOLARIS SOROKINIANA

J P Madsen and C F Hodges
Phytopathology
Volume 74 Number 12
Pages 1407-1411
1984

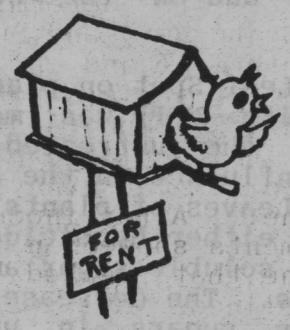
The herbicides MCPP and 2,4,5-TP were evaluated for effect on the free amino acid content of four sequentially aged leaves of herbicide tolerant Kentucky bluegrass and on subsequent Leaf Spot severity after infection by Bipolaris sorokiniana. The content of free amino acids in uninoculated leaves of herbicide untreated control plants generally declined from the youngest to the oldest leaf. The herbicides had no influence on total amino acids in leaves of any age.

Infected leaves of plants treated with either herbicide generally were more severely diseased than leaves of herbicide untreated control plants, but only MCPP treated plants had increased Leaf Spot on the youngest leaf. The results suggest that changes in free amino acid levels in leaves after treatment of Kentucky bluegrass with chlorophenoxy herbicides may be a component of physiological changes that are similar to changes during senescence. Changes in amino acid content induced by chlorophenoxy herbicides may promote leaf senescence in Kentucky bluegrass and the subsequent enhancement of Leaf Spot. However, changes in amino acid content independent of other metabolic changes occurring during senescence probably have limited direct influence on leaf spot severity.

NITROGEN EFFECTS ON THE PATHOGENICITY OF DRECHSLERA SOROKINIANA AND CURVULARIA GENICULATA ON GERMINATING SEED OF RED FESCUE

J P Madsen and C F Hodges
Phytopathology
Volume 70 Number 11
Pages 1033-1036
1980

Creeping red fescue is a fine-textured species adapted to turf culture and is susceptible to Drechslera sorokiniana which induces Leaf Spot, Seed and/or Seedling Rot and Root Rot. Creeping red fescue also is susceptible to Leaf-tip Dieback and Seed and/or Seedling Rot caused by Curvularia geniculata. The effects of ammonium sulfate and calcium nitrate on the pathogenicity of these two fungi singly and in combination on germinating seed of creeping red fescue were evaluated. Total seedling emergence from uninoculated seed in nonautoclaved soil was less than that in autoclaved soil in response to both nitrogen sources. These responses were suggestive of direct nitrogen toxicity to the germinating seed in autoclaved soil and of stimulation of unknown biotic factors in nonautoclaved soil that when combined with direct toxicity, additively reduced total emergence. The combination of the pathogens, together with the highest concentration of either nitrogen source, produced the most severe reduction in total seedling emergence. These results suggest a combination of direct toxicity to germinating seed and an enhancement of the pathogenicity by nitrogen-containing compounds.



EFFECT OF CHLOROPHENOXY HERBICIDES ON SOLUBLE SUGARS AND ON PATHOGENESIS BY DRECHSLERA SOROKINIANA IN SEQUENTIALLY SENESCENT LEAVES OF KENTUCKY BLUEGRASS

J P Madsen and C F Hodges
Phytopathology
Volume 73 Number 9
Pages 1296-1299
1983

In studies of the four most recently formed leaves on shoots of Kentucky bluegrass, severity of Leaf Spot increased on progressively older leaves of control, 2,4,5-TP and MCPP treated plants. Each progressively older leaf generally was more severely diseased on herbicide treated plants than on control plants except for leaf three. Total soluble sugar content of plant leaves treated with either herbicide was less than that of controls; sucrose, glucose and fructose constituted the loss. Inoculation of the two youngest leaves of control plants also decreased total soluble sugars; inoculation of leaf three of control plants increased sugars and had no effect on leaf four. Inoculation of leaves of all ages on plants treated with MCPP or 2,4,5-TP induced an increased in soluble sugars, primarily in glucose and fructose. Herbicide induced changes in the soluble sugar content of sequentially developing and senescing leaves are believed to be related to factors that promote senescence and enhance leaf spot severity.

EFFECTS OF NONIONIC SURFACTANTS ON ETHYLENE AND CHLOROPHYLL CONTENT OF KENTUCKY BLUEGRASS LEAVES INFECTED WITH BIPOLARIS SOROKINIANA

C M Ciaccio and C F Hodges
Plant Disease
Volume 71 February issue
Pages 149-152
1987

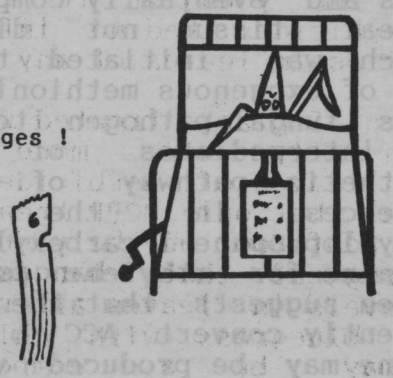
Use of surfactants on turfgrasses to improve effectiveness of foliar-applied pesticides and to increase water infiltration and percolation through hydrophobic soils is increasing. There is evidence that besides reducing surface tension at interfaces, surfactants are capable of exerting favorable and adverse biochemical effects on living organisms.

Research was initiated to determine the effects of Aqua-Gro, Hydro-Wet, and Surf-Side 37 on the endogenous ethylene and chlorophyll content of healthy and Bipolaris sorokiniana-infected leaves of Kentucky bluegrass. Short and long exposure of uninoculated plants to the surfactants failed to cause any changes in endogenous ethylene. After inoculation, plants from all treatments showed an increase in endogenous ethylene that peaked 48 to 72 hours and then declined by 96 hours. Surfactants induced increases and decreases in leaf chlorophyll content. Inoculation of leaves of plants exposed to surfactants resulted in a progressive loss of chlorophyll over time. Ethylene-chlorophyll interactions are important in disease relationships.

PHOTOMORPHOGENICALLY DEFINED LIGHT AND RESISTANCE OF KENTUCKY BLUEGRASS TO DRECHSLERA SOROKINIANA

K N Nilsen and C F Hodges
Plant Physiology
Volume 65
Pages 569-573
1980

The fungus pathogen Drechslera sorokiniana infects the leaves, stems and roots of numerous grass and cereal species. Accurate resolution of Drechslera sorokiniana Leaf Spot development required evaluation of separate leaf ages due to the sequential appearance, development, and senescence of Kentucky bluegrass leaves. Disease development under varying light treatments was greatest on leaf 4 [oldest, post mature] followed by leaf 1 [youngest, premature]. Low levels of disease occurred on leaves 2 and 3 [mature]. Light greater than natural light was most disease promotive on leaf 1. Light less than natural light was most disease promotive on leaf 4. These responses indicate that inherent resistance or susceptibility expressed by Kentucky bluegrass to pathogenesis by Drechslera sorokiniana is regulated in part by leaf age [developmental senescent stage and by photomorphogenically defined light quality.



ETHYLENE-INDUCED CHLOROSIS IN THE PATHOGENESIS OF BIPOLARIS SOROKINIANA LEAF SPOT OF KENTUCKY BLUEGRASS

C F Hodges and L W Coleman
Plant Physiology
Volume 75
Pages 462-465
1984

Ethylene production in plants infected by fungal pathogens often exceeds that produced by healthy plants. Endogenous ethylene of Kentucky bluegrass leaves infected by Bipolaris sorokiniana was evaluated as a factor in leaf chlorosis during pathogenesis. Detectable increases in edogenous ethylene of leaves of in tact plants under normal ambient pressure occurred 12 hours after inoculation and was maximum at 48 hours; from 48 to 96 hours the ethylene progressively decreased. Necrotic lesions surrounded by chlorotic halos occurred on infected leaves between 24 and 48 hours. Midvein chlorosis interconnecting individual lesions and complete chlorosis of all tissues not directly affected by the lesions occurred between 72 and 96 hours, after maximum production of ethylene at 48 hours. The chlorophyll loss in infected leaves by 96 hours was 44 percent compared with controls. Observations suggest that ethylene may function late in pathogenesis of this host-pathogen interaction and is responsible for much of the chlorophyll loss after its maximum production at 48 hours.

THRESHING THE JOURNALS continued

THE EFFECT OF METHIONINE ON ETHYLENE AND 1-AMINOCYCLOPROPANE-1-CARBOXYLIC ACID PRODUCTION BY BIPOLARIS SOROKINIANA

L W Coleman and C F Hodges
Phytopathology
Volume 76 Number 9
Pages 851-855
1986

Bipolaris sorokiniana is a serious pathogen of numerous grass species. Leaves of Kentucky bluegrass infected by this pathogen often produce a Leaf Spot that is characterized by a necrotic lesion surrounded by a chlorotic halo. As the disease progresses, symptoms are characterized by midvein chlorotic streaking, interconnecting lesions and eventually complete chlorosis of all leaf tissue not directly infected. Research was initiated to determine the effect of exogenous methionine on the ability of this fungal pathogen to produce ethylene and intermediates of the ethylene biosynthetic pathway of higher plants. Differences in the use of 1-aminocyclopropane-1-carboxylic acid [ACC] and Methionine for ethylene production by the pathogen suggests that the pathogen does not efficiently convert ACC to ethylene and that ethylene may be produced via more than one pathway.

ETHYLENE BIOSYNTHESIS IN KENTUCKY BLUEGRASS LEAVES IN RESPONSE TO INJURY OR INFECTION BY BIPOLARIS SOROKINIANA

L W Coleman and C F Hodges
Phytopathology
Volume 77 Number 9
Pages 1280-1283
1987

Ethylene production by stressed, mechanically wounded and diseased plants has been studied extensively. Biosynthesis of ethylene in host-pathogen interactions is believed to differ from that of wounded plants or plants undergoing changes in development. Research was initiated to evaluate 1-aminocyclopropane-1-carboxylic acid [ACC] synthase activity, content and endogenous ethylene of Kentucky bluegrass leaf blades subjected to wounding or infection by Bipolaris sorokiniana. Infection resulted in peak ethylene production 36 hours after inoculation followed by peak ACC synthase activity at 72 hours. Endogenous ethylene produced in response to infection was somewhat greater than that produced in response to wounding and peak ACC synthase activity was more than five times greater in response to infection than to wounding.

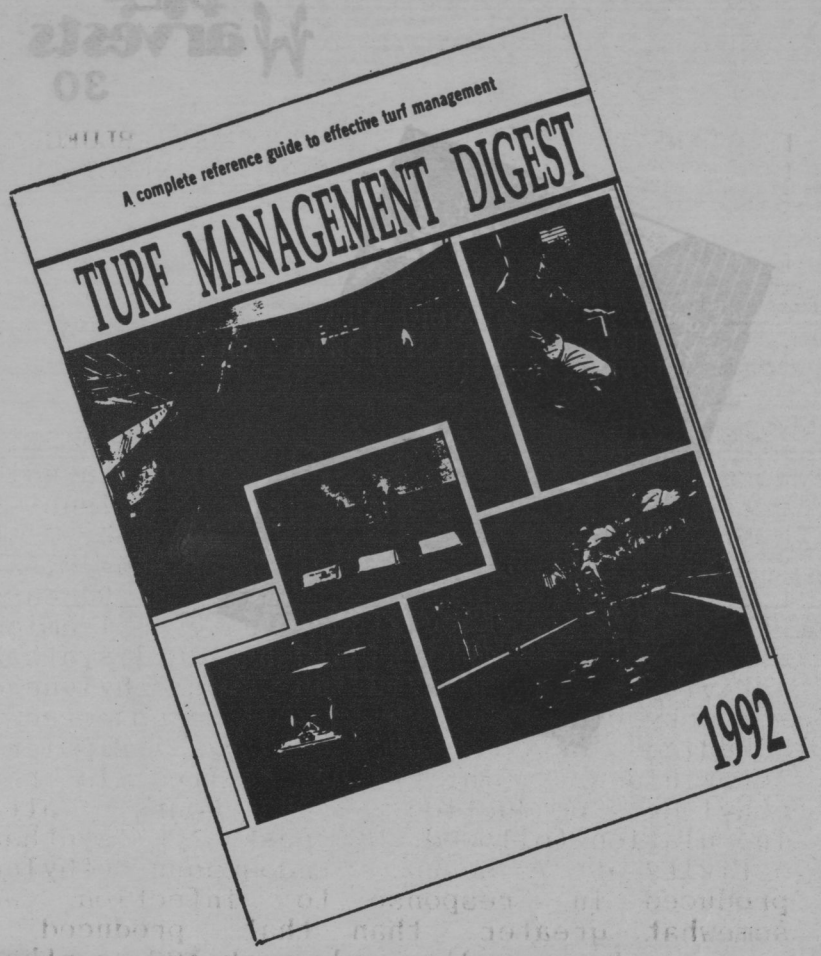
YOU WANT THE DAY OFF ?

"Let's look at what you are asking for: There are 365 days per year available for work. There are 52 weeks per year in which you already have 2 days off per week, leaving 261 days available for work. Since you spend 16 hours each day away from work, you have used up 170 days, leaving only 91 days available.

"You spend 30 minutes each day on your coffee break - that accounts for 23 days each year, leaving only 68 days available. With a 1-hour lunch period each day, you have used up another 48 days, leaving only 22 days available for work.

"You normally spend 2 days per year on sick leave. This leaves you only 20 days available for work. We offer 5 holidays per year, so your available working time is down to 15 days. We generously give you 14 days vacation per year, which leaves you only 1 day available for work, and I'll be darned if you're going to take that day off !"

George White, VP
Assn of Community Travel Clubs
St Louis
In Association Trends 11/17/89



TURF MANAGEMENT DIGEST

Dr William Knoop is Editor of this complete reference guide to effective turf management published by Farm Press Publications [P O Box 1420, Clarksdale MS 38614]. This will be published annually in January.

Twenty one chapters range from Turfgrasses, Establishment, Soils, Equipment Management, Small Engines and chapters on various maintenance procedures,. There is a Turf Meeting Calendar, Conversion Tables and a Glossary of Terms.

168 pages
Cost single copy: $14.95 [plus $3.00 shipping]

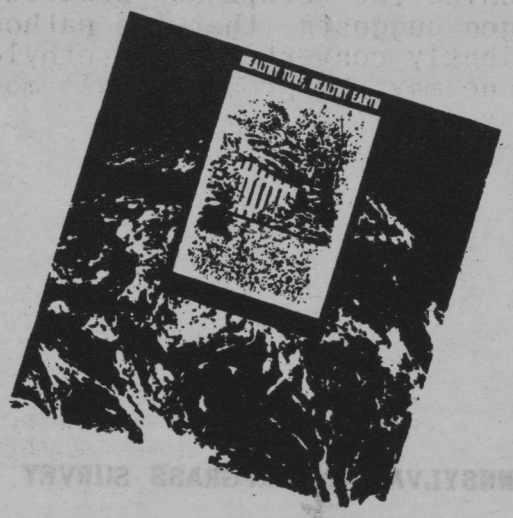
TURFGRASS
AGRONOMY MONOGRAPH 32

Turfgrass, Agronomy Monograph 32, edited by Drs Waddington, Carrow and Shearman, updates some of the topics from Monograph 14 published in 1969. Five sections contain 22 chapters written by Turfgrass Specialists.

The first section explores the turfgrass industry and includes "Turfgrass Science - An Overview" by Dr Eliot Roberts, Dr Wayne Huffine, Dr Fred Grau and Mr Jack Murray. Other sections are: Turfgrass Physiology, Soils & Water, Management and Research Methods.

This source of information will be a valuable resource for teachers, turfgrass professionals, and industry representatives.

American Society of Agronomy
Book Order Department
677 So Segoe Road, Madison WI 53711-1086
828 pages 1992
$42.00



HEALTHY TURF, HEALTHY EARTH

A 10 page booklet with color pictures and graphics that attempts to answer questions and clear up some confusion about lawn care products used to maintain a healthy yard. Benefits of the grass system, what makes healthy turf, products, especially fertilizer are covered in an easy to read format.

The Fertilizer Institute
501 2nd St NE
Washington DC 20002
202/675-8250

COMPENDIUM OF TURFGRASS DISEASE, Second Edition

The American Phytopathological Society has released the second edition of The Compendium of Turfgrass Disease by Drs Richard Smiley, Peter Dernoeden and Bruce Clarke. The Lawn Institute is one of the four financial sponsors. This is a general and practical reference for all those involved in the culture of fine turf. It blends descriptive terminology with the more technical language of plant pathology to serve a diverse audience. The emphasis is on diseases of North America. Following the Introduction, there are sections on: Noninfectious Diseases; Infectious Diseases; Other Agents, Diseases and Disorders; Ecology and Taxonomy of Pathogenic Fungi; Disease Control Strategy; and Disease Diagnosis.

The American Phytopathological Society
3340 Pilot Knob Road
St Paul, Minnesota 55121-2097
98 pages 1992

PENNSYLVANIA TURFGRASS SURVEY

The Pennsylvania Turfgrass Council and PA Department of Agriculture sponsored a survey which has recently been released.

The Summary Report shows that Pennsylvania had 1,999,408 acres of turfgrass in 1989. Home lawns covered 1,355,000 acres and roadsides 102,073 acres.

Total turf maintenance expenditures were $1.46 billion with 77 % of this being for home lawns. The value of all equipment used for turf maintenance was $2.95 billion.

For more information contact: Dr Peter Landschoot or Dr Thomas Watschke, Department of Agronomy, 116 ASI Bldg, Pennsylvania State University, State College PA 16802 [814/863-1017].

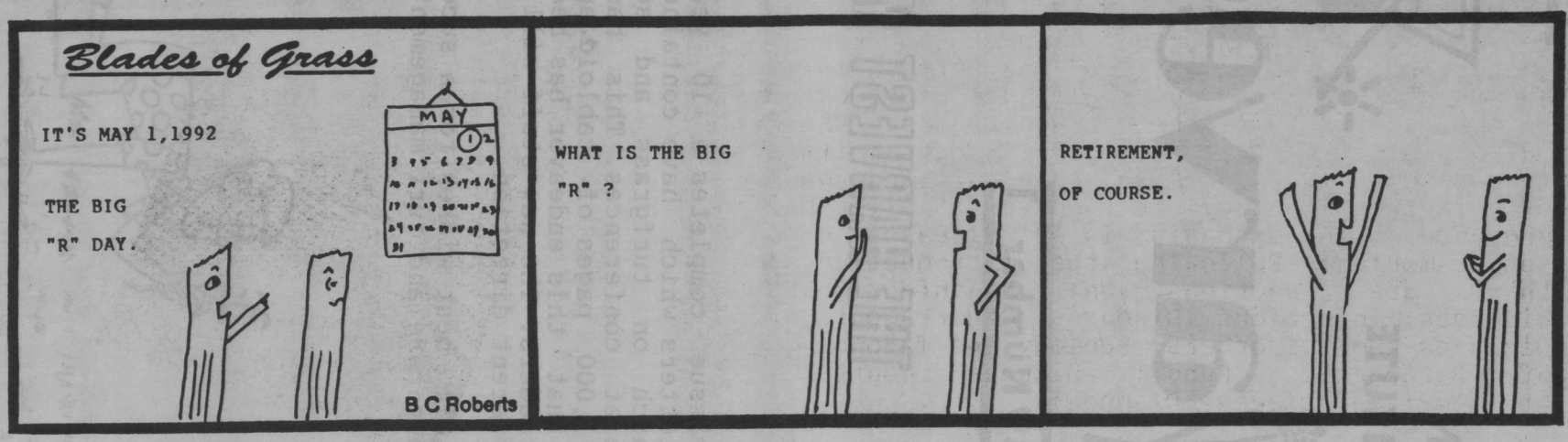
THE LAWNSCAPE: A NATURAL SCIENCE LABORATORY

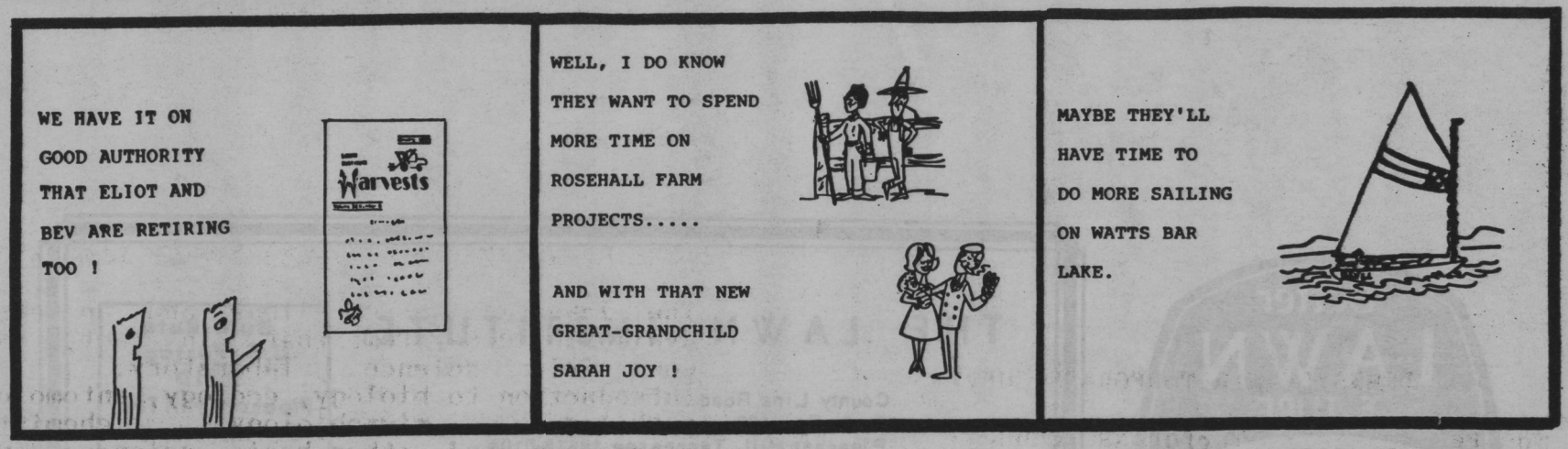
The lawn is an excellent and an easily available ecosystem that, in fact, is a wonderful science laboratory. An introduction to biology, ecology, entomology, pathology, microbiology, chemistry, mineralogy, and other basic sciences can be taught using experiments on the school and/or students lawns.

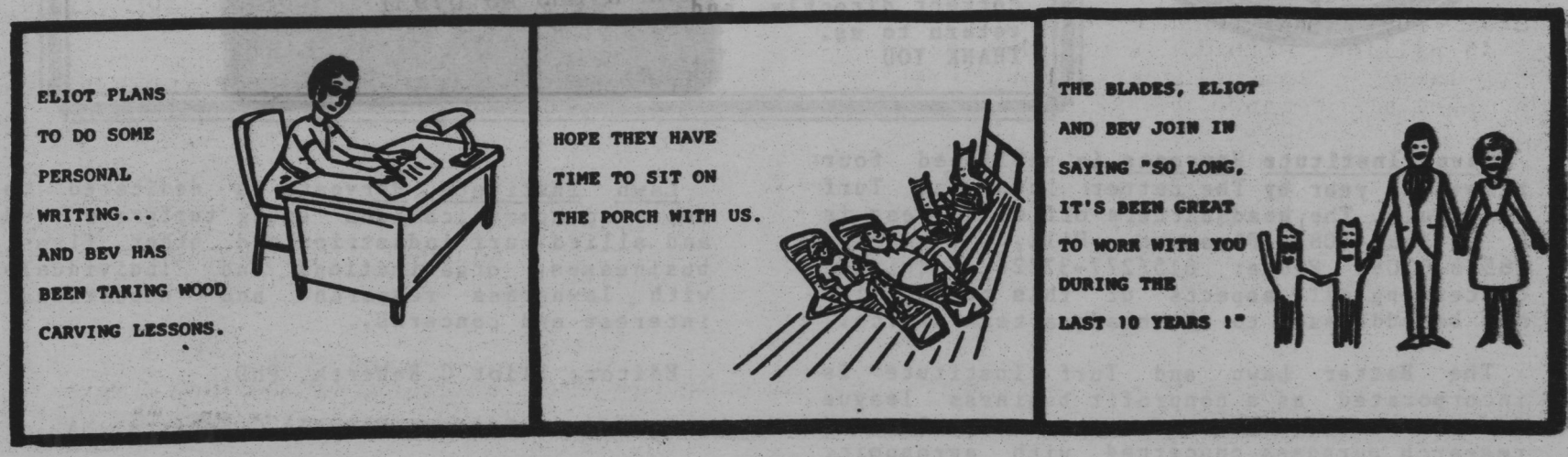
Material on the lawnscape has been adapted by Dr Richard Duble of Texas A & M University for use by teachers in schools with an overview, exercises and tests. This is an excellent beginning for a curriculum in science/math based on the lawn.

It would seem that this forms the basis for a variety of materials that might be used with youngsters who will in a few years have their own lawns and presently pass information on to their parents. WHAT A WONDERFUL OPPORTUNITY FOR THE LAWN AND TURF INDUSTRY TO DISTRIBUTE ACCURATE INFORMATION AND TO HAVE POSITIVE IMPACT ON THE PUBLIC !

For more information contact: Dr Richard Duble, Soil & Crop Sciences Dept, Texas A & M University, College Station TX 77843 [409/845-4826].


Blades of Grass
IT'S MAY 1,1992
THE BIG
"R" DAY.
MAY
B C Roberts
WHAT IS THE BIG
"R" ?
RETIREMENT,
OF COURSE.


WE HAVE IT ON
GOOD AUTHORITY
THAT ELIOT AND
BEV ARE RETIRING
TOO !
Warvests
WELL, I DO KNOW
THEY WANT TO SPEND
MORE TIME ON
ROSEHALL FARM
PROJECTS.....
AND WITH THAT NEW
GREAT-GRANDCHILD
SARAH JOY !
MAYBE THEY'LL
HAVE TIME TO
DO MORE SAILING
ON WATTS BAR
LAKE.


ELIOT PLANS
TO DO SOME
PERSONAL
WRITING...
AND BEV HAS
BEEN TAKING WOOD
CARVING LESSONS.
HOPE THEY HAVE
TIME TO SIT ON
THE PORCH WITH US.
THE BLADES, ELIOT
AND BEV JOIN IN
SAYING "SO LONG,
IT'S BEEN GREAT
TO WORK WITH YOU
DURING THE
LAST 10 YEARS !"

THE LAWN INSTITUTE

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return to us.
THANK YOU

JAMES SNOW
GREEN SECTION
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FAR HILLS NJ 07931

Lawn Institute Harvests is published four times a year by The Better Lawn and Turf Institute. The headquarters office address is P O Box 108, Pleasant Hill, Tennessee 38578-0108. Phone: 615/277-3722. Inquiries concerning all aspects of this publication may be addressed to the headquarters office.

The Better Lawn and Turf Institute is incorporated as a nonprofit business league formed exclusively for educational and research purposes concerned with agronomic, horticultural and landscape concepts.

Lawn Institute Harvests is dedicated to improved communications among turfgrass seed and allied turf industries and other firms, businesses, organizations and individuals with lawngrass research and educational interest and concerns.

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