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THE HARVEST MIX

- Thirty-two turfgrass research papers covering all aspects of sports and residential grasses are reviewed in this issue.
- Two papers from the November 1984 Missouri Turf Conference and four from the 1984 New Jersey Expo are highlighted.

- An outline of turfgrass research conducted at five key stations identifies areas of emphasis in the eastern and midwestern United States.
- Notes of interest from P O Box 108 include items on Wetting Agents, Turfgrass Surveys, New Publications and Slide Sets.
- Articles on turfgrass foliar feeding and coloring the public message provide an update on these topics of continuing importance.

- A review of turfgrass and grounds management career opportunities and related courses of study at the college level is directed towards helping to meet needs for personnel who are technically well qualified.

THREADING THE JOURNALS

(Published research results)

EFFECT OF A GRASS ON GROWTH AND MYCORRHIZATION OF POTTED APPLE TREES

L Reich 1985

HortScience Vol 20 Number 2 pages 265-267

Vesicular-arbuscular mycorrhiza are ubiquitous and usually enhance plant growth primarily by their effect on phosphorus uptake. The specific fungal species and the amount of mycorrhizal infection can be influenced by groundcover management. Grass groundcover increases root mycorrhization and, hence, phosphorus uptake by providing a high inoculum density for the relatively sparse roots of woody plants. Effects of the grass are very likely on mycorrhizal function rather than the amount of mycorrhization, since the percentage of mycorrhization of the roots, the root weight and the number of root laterals were each decreased in the presence of the grass cohost.

Editors note: The value of mycorrhiza associations with many woody landscape plants is well demonstrated. This work indicates grass ground cover enhances this association.

SALINITY EFFECTS ON PERENNIAL RYEGRASS GERMINATION

A E Dudeck and C H Peacock 1985

HortScience Vol 20 Number 2 pages 268-269

Increased use of saline water for turf irrigation is producing serious problems in Florida and other southern states. Cool-season turfgrasses are overseeded annually into dormant warm-season turfs in the southern United States. Perennial ryegrass is widely used for overseeding because of its rapid germination and seedling growth. Mature perennial ryegrass has moderate salt tolerance. Total germination of Pennant, Citation II, Palmer, Horizon, Derby and Fiesta perennial ryegrasses was unaffected by up to 10,000 parts per million of salinity in the germination medium. Rate of germination decreased with increased salinity. Pennant was affected less and Fiesta slightly more than the others in rate of germination.

TALL FESCUE TURF PERFORMANCE UNDER A TREE SHADE

L Wu, D Huff and W B Davis 1985

HortScience Vol 20 Number 2 pages 281-282

New turf type tall fescue cultivars are being used throughout the northern United States and into the transition zone at an increasing rate. Under shade conditions, Alta was inferior in turf performance compared to Falcon, Rebel and Houndog. No difference in turf performance was noted among Falcon, Rebel and Houndog under the tree shade. Shade resulted in a greater reduction in plant size than in plant density. Falcon, Rebel and Houndog produced a reasonable turf stand under seventy percent tree shade. No shade related disease problem, such as powdery mildew, was found in these three tall fescue cultivars.

KENTUCKY BLUEGRASS LATERAL GROWTH AND STEM RUST RESPONSE TO SOIL COMPACTION STRESS

R C Shearman and J E Watkins 1985

HortScience Vol 20 Number 3 pages 388-390

Turfgrasses are usually exposed to traffic that results in wear injury and soil compaction related stress on the plants. In this field study, compaction stress reduced lateral spread of most of the twenty Kentucky bluegrasses tested. There were no grasses having greater spread in compacted than in noncompacted soil. Vantage, Cheri and Merion Kentucky bluegrasses maintained the same lateral growth under both compacted and noncompacted soil conditions. Compaction increased stem rust incidence, particularly for those cultivars that are either susceptible or moderately susceptible.

THRESHING THE JOURNALS CONTINUED

FERTILIZER BURN COMPARISONS OF CONCENTRATED LIQUID FERTILIZERS APPLIED TO KENTUCKY BLUEGRASS TURF

Sally J Johnson and Nick E Christians 1984

Journal of the American Society for Horticultural Science Vol 109 Number 6 pages 890-893

Use of liquid fertilizer in the United States has increased to about thirty percent of all fertilizer applied each year. The lawn care industry has found these fertilizers useful and effective. Foliar burn must be prevented in order to maintain a high level of consumer satisfaction. In this Iowa study, a blend of Adelphi, Aquila, Glade and Parade Kentucky bluegrasses was used to evaluate Fluf, Fluf-Plus, Tuf, Fan NPK, Formolene, Maxigro-Plus, Urea and Folian applied at three rates. The methylene ureas, including Fluf, Fluf-Plus and Tuf caused minimal burn at all nitrogen rates. Formolene was safely applied at the two lower rates and was marginally acceptable at the highest rate. Fan NPK, Urea and Folian caused unacceptable turf injury at the high rates. Rates of nitrogen application were : 12.2, 24.4 and 48.8 Kg Nitrogen/ha (0.25, 0.50 and 1.00 pounds of nitrogen per 1000 square feet.)

ZOYSIAGRASS ESTABLISHMENT IN KENTUCKY BLUEGRASS USING GROWTH RETARDANTS

G P Hubbell and J H Dunn 1985

Journal of the American Society for Horticultural Science Vol 110 Number 1 pages 58-61

Meyer zoysia is a warm season cultivar becoming increasingly popular as a turfgrass for the transition zone. It performs well in hot and dry summers of the upper south and is superior in winter hardiness compared with bermudagrass. Planting by vegetative means results in a minimum of two years for complete establishment. Where zoysia is planted within existing turf, the spread of zoysia is particularly slow. In a Baron Kentucky bluegrass turf treated with Mefluidide, spread of zoysia was increased twenty percent compared with nontreated turf during the first year. No serious injury was noted on the bluegrass. Fertilization of zoysia plugs with ureaformaldehyde (38-0-0) also increased cover by ten to twenty percent during the first two years. Irrigation had no effect on zoysia spread as long as summer rainfall was normal.

AMMONIUM NITROGEN MOVEMENT IN A COARSE-TEXTURED SOIL AMENDED WITH ZEOLITE

C T MacKown and T C Tucker 1985

Soil Science Society of America Journal Vol 49 Number 1 pages 235-238

Innovative management practices are required to minimize leaching and volatilization of nitrogen fertilizer from coarse-textured soils. Timing of fertilizer application, use of slow-release nitrogen sources and chemical suppression of nitrification are practices of proven value. Soil retention of ammoniacal fertilizers is dependent on the soil cation exchange capacity, the concentration of the ammonium ion and its relationship to other ions, the soil pH and the rate of water movement through the soil. The application of soil amendments to enhance the retention of the ammonium ion in course-textured soils has been found effective in increasing nitrogen fertilizer efficiency. Zeolites enhance the retention of the ammonium ion subject to leaching. Zeolite application per unit soil volume may be maximized by restricting the depth of incorporation. These research results demonstrated 15 times more nitrogen loss in unamended soil with a cation exchange capacity of 29 compared with an amended soil with a cation exchange capacity of 102.

Editors note: Turf research with Zeolites in Arizona has produced similar results.

CALLUS INDUCTION, PLANT REGENERATION, AND EVIDENCE OF SOMATIC EMBRYOGENESIS IN RED FESCUE

W A Torello, A G Symington and R Rufner 1984

Crop Science Vol 24 Number 6 pages 1037-1040

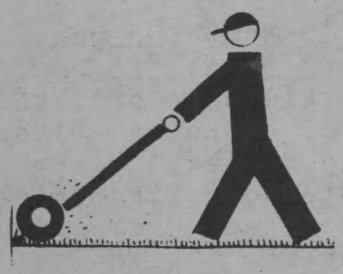
The in vitro culture of plant cells and tissues has provided unique systems for studying basic physiological processes as well as for genetic improvement. The initiation and growth of callus tissue and subsequent regeneration of viable plants are prerequisites which must be met prior to any attempts at genetic improvement. These prerequisites are only recently being met for turfgrass species. Jamestown and Dawson fine leaved fescues both formed maximum callus induction and growth. Plant regeneration was extremely high from Dawson callus compared to Jamestown. The majority of Dawson calli were embryogenic, white to yellow and compact compared to the translucent, friable nonembryogenic Jamestown callus.

EFFECTS OF CLIPPING ON GROWTH AND PHYSIOLOGY OF MERION KENTUCKY BLUEGRASS

J V Krans and J B Beard 1985

Crop Science Vol 25 Number 1 pages 17-20.

Mowing is the most common cultural practice applied to turfgrasses. Cutting height and frequency of turfgrasses differ depending on species, turfgrass use and culture. Dry weight of Merion Kentucky bluegrass roots and regrowth of shoots following clipping is greater in plants frequently cut at 2.5 centimeters (1 inch) than in plants infrequently cut at 6.2 centimeters (2 1/2 inches). Lateral stem formation (tillers plus rhizomes) are similar or greater in plants cut biweekly or semiweekly at both cutting heights. Root : shoot (sheath plus blade tissue) ratios are generally greater in plants cut semiweekly than in those cut weekly or biweekly at both cutting heights. Plants clipped frequently have in most cases greater carbon-photoassimilate accumulation in the root and sheath fractions and less accumulation in the blade fraction than plants clipped infrequently. Rates of apparent photosynthesis and dark respiration per unit leaf area are generally higher in plants cut semiweekly than biweekly. Reduced growth and vigor associated with close and frequent clipping of Merion Kentucky bluegrass is attributed to loss of leaf area. Based on these findings, altering clipping frequency may be more effective in reducing the detrimental effects of clipping in Merion Kentucky bluegrass than adjustments in cutting height.



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

Jeffery L Nus and Clinton F Hodges 1985

Crop Science Vol 25 Number 1 pages 97-101

Stripe smut and flag smut are pathogens of numerous grass species including Kentucky bluegrass. Bluegrasses infected with these pathogens exhibit greater mortality than otherwise healthy plants during periods of water stress. This is suggestive of decreased drought tolerance as a result of infection. Infection of Merion bluegrass by strip smut increased total and leaf dry weight and decreased root weight and root-shoot ratios of plants. Plants infected by flag smut exhibited decreased total, leaf and root weights and root-shoot ratios. Total leaf and root weights of healthy (non-moisture stressed 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.

HERITABILITY ESTIMATES FOR TURFGRASS CHARACTERISTICS IN BERMUDAGRASS

D S Wofford and A A Baltensperger

Crop Science Volume 25 Number 1 pages 133-136

Bermudagrass is one of the most widely grown warm-season perennial grass species in the southern United States. Numerous cultivars are commercially available. The vast majority of these cultivars are vegetatively propagated. This may be due to the increased uniformity attained through the use of a single genotype, the existence of economical vegetative planting methods and/or breeding problems in plant fertility. No genetic estimates for turfgrass characteristics in bermudagrass are currently available. Genetic variation among bermudagrass clones and their polycross progenies in addition to estimation of heritability values for eighteen turfgrass characteristics have been investigated. The parental clones differed for all characteristics. Polycross families differed for 13 of the 18 characters evaluated. The performance of all characteristics evaluated should be improved using traditional breeding procedures. In some situations, mass selection should be an efficient method for the improvement of a seeded population.

THRESHING THE JOURNALS CONTINUED

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

Jeffery L Nus and Clinton F Hodges 1985

Crop Science Vol 25 Number 2 pages 322-326

Several pathogens cause water deficits in their hosts by altering water relations. Host water deficits can be induced by accelerated water loss, reduced water uptake and loss of membrane integrity, which may result in inability of cells to retain solutes and water. Stripe smut and flag smut infect numerous grass species, including Kentucky bluegrass. Merion Kentucky bluegrass has been studied for the effects of water stress and systemic infection by smut producing pathogens on leaf turgor and water potentials. Infection by either pathogen decreases leaf turgor and water potentials during light and dark periods as compared with noninfected plants. In addition, noninfected plants maintain higher leaf turgor and water potentials than infected plants as osmotic potentials of the solution culture are lowered. The pathogen induced stress seems to decrease the ability of diseased plants to osmotically adjust to water stress and in the case of flag smut, cell wall rigidity is decreased. The physiological effects of reduced drought tolerance become evident and result in increased mortality of diseased plants only after infected Kentucky bluegrass is subjected to growth limiting water deficits.

HARDENING BEHAVIOR, WINTER SURVIVAL, AND FORAGE PRODUCTIVITY OF FESTUCA SPECIES AND CULTIVARS IN SUBARTIC ALASKA

L J Klebesadel 1985

Crop Science Vol 25 Number 3 pages 441-447

The genus Festuca encompasses about 100 species in temperate and cool zones and several of the perennial species are used widely for forage and turf. These are divided into two morphological types; the broad-leaved group contains tall fescue and meadow fescue; the fine-leaved group includes red fescue, Chewings fescue, sheep fescue and hard fescue. The broad-leaved species are native to Europe and introduced to North America. At least seven fine-leaved species, including red fescue, are native to Alaska. Marginal to inadequate winterhardiness is a continuing limitation in grasses used for turf purposes in subarctic southcentral Alaska. In this region, all broad-leaved fescues evaluated winter killed completely during the first or second winter of each test. Fine-leaved fescues Highlight, Durar, commercial Chewings fescue and red fescue cultivars Ranier, Pennlawn, Illahee, Boreal and Olds were all susceptible to winter kill. Duraturf was most winterhardy except for Arctared, developed in Alaska. Hardiness rankings of red fescues from greatest to least were Arctared, Duraturf, Boreal, Olds, Ranier, Pennlawn, Illahee. Superior winterhardiness of Arctared was associated with northernmost adaptation, highest percent dry matter in crowns, highest levels of stored reserves and slowest expression of reserves as etiolated growth. Poorest winter survival occurred with southern most adapted Illahee which was lowest in percent dry matter in crowns and stored lowest levels of food reserves. Duraturf of intermediate-latitudinal adaptation was intermediate in crown moisture, reserve storage and winter survival.

ANATOMY, MORPHOLOGY AND GROWTH OF TALL FESCUE RHIZOMES

J A Jernstedt and J H Bouton 1985

Crop Science Vol 25 Number 3 pages 539-542

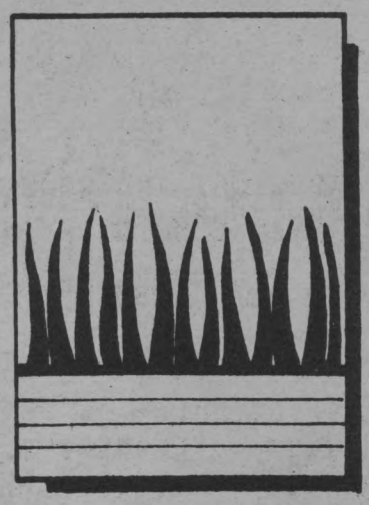
Anatomically, rhizomes of tall fescue resemble those of Kentucky bluegrass with regard to a spongy cortex, a large pith area, one to two rings of alternately spaced vascular bundles and sclerified bundle sheaths which merge with a ring of sclerenchyma demarcating vascular tissue from cortical parenchyma. Rhizomes of tall fescue and Kentucky bluegrass differ in diameter and number of conducting elements per bundle, yet the overall structure and internal organization of the two organs is very similar and suggests that they may be analogous structures. In tillers of tall fescue, vascular bundles are numerous and closely spaced in cross-sectional view. This may be a consequence of shorter internodes and larger and more highly developed leaves born at tiller nodes. In contrast, rhizomes bear small scale-like leaves at widely spaced nodes and fewer vascular bundles, each with more abundant strengthening tissue.

ESTABLISHMENT CHARACTERISTICS OF KENTUCKY BLUEGRASS-PERENNIAL RYEGRASS TURF MIXTURES AS AFFECTED BY SEEDING RATE AND RATIO

A D Brede and J M Duich 1984

Agronomy Journal Vol 76 Number 6
pages 875-879

Mixtures of grass species are desirable in a lawn for genetic diversity and to help ensure against establishment failures. In studies with mixtures of Touchdown Kentucky bluegrass and Pennfine perennial ryegrass mixtures tended to outperform monocultures by eight percent in leaf area index, by fourteen percent in shoot density two months after establishment, by eleven and six percent in foliar ground cover at 1.4 and 3 months respectively and by forty-four percent in spring greening. A bluegrass-ryegrass mixture containing seventy to ninety-five percent bluegrass field-viable seeds provided the best compromise between adequate establishment of the bluegrass and minimal clumping of the ryegrass, which often occurs at low ryegrass seed densities. Low seeding rates of bluegrass and high rates of ryegrass tended to produce plants with the thinnest leaves during establishment.



TALL FESCUE AND KENTUCKY BLUEGRASS RESPONSE TO FERTILIZER AND LIME SEED COATINGS

A L Hathcock, P H Dernoeden, T R Turner and M S McIntosh 1984

Agronomy Journal Vol 76 Number 6
pages 879-883

Seed coating refers to the placement of a material on seed for the purpose of enhancing growth, survival or planting of a species. Coated seed research in the last thirty years has been conducted primarily with legume species; however the process of coating plant seed has been employed in various formats for over seventy-five years. The desired benefit of coating seed is to provide a self-sustaining seed unit with an improved microenvironment for germination and seedling development. Slow establishment of Kentucky 31 fescue and Adelphi Kentucky bluegrass from seed may be associated with inadequate or improper application of fertilizer and lime. Coating of seed with these items for use in establishing turf on steep slopes or over large areas of land could enhance germination and seedling growth and reduce time and energy involved in seedbed preparation. Seed of both species coated with treble super-phosphate exhibited little or no germination. Dicalcium phosphate, urea, sulfate of potash, dolomitic limestone and seed coating adhesives (methocel A-15 and gum arabic) had no deleterious effects upon seed germination or seedling growth. Phosphorus and nitrogen coatings combined generally improved germination percentages when compared to other treatments. Seedling development of Kentucky bluegrass and tall fescue was improved when seed were coated with lime and fertilizer.

FOLIAR APPLICATION OF NITROGEN AND IRON TO KENTUCKY BLUEGRASS

A K Yust, D J Wehner and T W Fermanian 1984

Agronomy Journal Vol 76 Number 6
pages 934-938

Density, color and uniformity are the major characteristics determining the perceived quality of a turfgrass stand. The goal of the professional lawn care industry is to provide the homeowner with a dark green weed-free lawn. Members of this industry are interested in techniques to enhance the color of a turfgrass stand in lieu off excessive nitrogen fertilization. A lawn turf of Columbia and Touchdown Kentucky bluegrasses was used in this Illinois study. Color enhancement from iron applications without nitrogen may last from several weeks to several months depending on the weather following application. Use of iron during cool wet periods enhanced turf color for only two to three weeks and therefore was considered of limited value. Iron applications during cool dry periods enhanced turf color for several months. Iron chelate was determined most effective in these tests. The combination of iron with limited nitrogen developed a color response equal to that of twice the nitrogen without the iron. High rates of iron can cause phytotoxicity.

SYRINGING EFFECTS ON THE CANOPY TEMPERATURES OF BENTGRASS GREENS

J M DiPaola 1984

Agronomy Journal Vol 76 Number 6
pages 951-953

Syringing of fine turf, particularly bentgrass golf greens, is practiced throughout the United States. The practical utility of syringing for canopy temperature reduction under the warm, humid conditions of the southeastern United States was examined on a Penncross creeping bentgrass green constructed to U S Golf Association specifications. In the absence of wilt, bentgrass canopy temperatures were not altered one hour after syringing regardless of the volume of water or timing of the syringing application. Therefore, in the absence of wilt, the routine syringing of bentgrass greens must be reevaluated given the substantial economic cost of this procedure, particularly for labor and water.

LUXURY WATER USE BY BERMUDAGRASS TURF

W R Kneebone and I L Pepper 1984

Agronomy Journal Vol 76 Number 6
pages 999-1002

There has been much discussion and some research on what normal evapotranspiration from bermudagrass turf should be. There has been some discussion but no research on what maximum evapotranspiration from bermudagrass turf might be. Research in Arizona on common bermudagrass turf has demonstrated that as irrigation levels increase, evapotranspiration levels increase. With sand-soil substrates evapotranspiration measured 31,49 and 53 millimeters [1 to 2 inches] during a seven day period. Evapotranspiration levels were highest on substrates highest in soil. Luxury use of water implies consumption far beyond need. In the past excessive watering has been recognized as a waste of irrigation water lost by deep percolation and by surface runoff. New data show that with sufficient indulgence the turf itself can become a luxury user, and evapotranspiration losses from bermudagrass turf can exceed pan evaporation by a considerable amount.

MOISTURE SENSOR-CONTROLLED IRRIGATION FOR REDUCING NITROGEN LEACHING IN BERMUDAGRASS TURF

G H Snyder, B J Augustin and
J M Davidson 1984

Agronomy Journal Vol 76 Number 6
pages 964-969

Nitrogen is the most important nutrient for turfgrass culture in terms of its requirement, frequency and rate of application, total cost and the magnitude of plant response. The fate of applied nitrogen and particularly nitrogen leaching losses in turfgrasses as affected by irrigation is of interest. In studies in Florida with bermudagrass grown on sand, nitrogen leaching varied from fifty-six percent to less than one percent of that applied depending on treatment. An ammonium nitrate source combined with daily irrigation produced the greatest nitrogen losses (twenty two to fifty six percent). Application of ammonium nitrate through the irrigation system with each irrigation determined by tensiometer soil moisture sensors produced the smallest losses (less than one to six percent). Using the sensor to determine irrigation needs reduced nitrogen leaching from all nitrogen sources. The combination of sensor irrigation and fertilization with irrigation or use of sulfur coated urea produced the least nitrogen leaching while maintaining acceptable turfgrass growth and quality.

GROWTH AND WATER USE OF TALL FESCUE AS INFLUENCED BY SEVERAL SOIL DRYING CYCLES

M J King and L P Bush 1985

Agronomy Journal Vol 77 Number 1
pages 1-4

Stress hardening, sometimes called stress adaptation, refers to the response of a plant to a stress in such manner as to make it less sensitive to subsequent like stresses. Little research has been done, until recently, on effects of mild or sublethal moisture stress on subsequent plant response to moisture stress. In nature, periods of mild moisture stress occur very often because of precipitation patterns and/or temperatures. The moisture stress history of plant tissue has seldom been considered when metabolic responses are analyzed. By delaying water use, favorable water status and physiological activities could be maintained during a short, mild moisture stress period. However, during extended periods of moistures stress [weeks] the decreased root development could create an unfavorable condition in that the smaller root mass would permeate less soil volume and consequently less total water would be available to the plant.

EFFECT OF ACIDITY AND NITROGEN SOURCE ON THE GROWTH AND THATCH ACCUMULATION OF TIFGREEN BERMUDAGRASS AND ON SOIL NUTRIENT RETENTION

J B Sartain 1985

Agronomy Journal Vol 77 Number 1
pages 33-36

Turfgrasses grown on sandy, highly porous soils in the southeastern United States require large quantities of nitrogen fertilizers to remain a desirable dark green. This nitrogen may be supplied as a soluble, slow release organic or natural organic compound. A Florida study on Tifgreen bermudagrass produced maximum growth rates at soil pH values less than 4.0. Overall turfgrass quality was not influenced by nitrogen source or frequency of application. Acidity promoted thatch accumulation, except in the presence of applied calcium. Lower levels of thatch accumulated where IBDU was used. Frequency of application had no effect on the thatch accumulation in turf receiving IBDU and activated sewage sludge. A high quality, rapid growing Tifgreen bermudagrass can be produced under putting green conditions using soluble inorganic ammonium sulfate. The primary long-term disadvantages of using ammonium sulfate are excessive thatch accumulation and leaching of plant nutrients. Addition of calcium in the form of calcium hydroxide reduced thatch accumulation and nutrient loss.

SALT TOLERANCE OF GRASSES AND LEGUMES FOR ROADSIDE USE

L J Greub, P N Drolsom and
D A Rohweder 1985

Agronomy Journal Vol 77 Number 1
pages 76-80

Failure to maintain adequate vegetative cover along roadsides causes increased soil erosion and mars the esthetic qualities of highways and streets. The use of sodium chloride as a deicing compound on roadways in northern states has caused phytotoxic concentrations of sodium and chloride ions in the adjacent soils. Both ions have the potential to affect plant growth adversely, but there is evidence that chloride may have greater toxic effects than sodium. Forty grass and legume species, cultivars and genotypes have been evaluated under Wisconsin conditions. Most salt tolerant were lemmon alkaligrass, alkali sacaton, nuttall alkaligrass, a puccinellia roadside selection and weeping alkaligrass. Serious foliage injury was found for Seaside creeping bentgrass, quackgrass, Alta tall fescue, NK-200 perennial ryegrass, creeping meadow foxtail, red top, Ruby creeping red fescue, and rough stalk bluegrass. Among legumes tested, Vernal alfalfa and Eski sainfoin were most salt tolerant.

EFFECTS OF SALINITY ON SEASHORE PASPALUM TURFGRASSES

A E Dudeck and C H Peacock 1985

Agronomy Journal Vol 77 Number 1
pages 47-50

Increased need for salt tolerant grasses continues because of salt accumulation in soil, increased restrictions on groundwater utilization, and salt water intrusion into groundwater. The use of seashore paspalum as a turfgrass for saline situations is enhanced by the availability of Futurf and Adalayd. In Florida tests Futurf was found to be intermediate and Adalayd least tolerant of four seashore paspalum entries. Salinity differentially affected tissue content of calcium, chlorine, potassium, magnesium and sodium. Tissue content of calcium, potassium and magnesium decreased with increased salinity. No mortality was observed, although top growth of all grasses was severly reduced at the highest salt level.

SELECTIVE CONTROL OF TALL FESCUE IN KENTUCKY BLUEGRASS WITH CHLORSULFURON

D J Larocque and N E Christians

Agronomy Journal Vol 77 Number 1
pages 86-89

Tall fescue is a coarse-bladed perennial cool-season grass, which often occurs as a weed in Kentucky bluegrass turf. Presently there is no labeled herbicide treatment that will selectively control this species. Tests in Iowa on Baron Kentucky bluegrass and Kentucky 31 tall fescue indicated damage to the fescue with a single application of chlorsulfuron applied at a rate of 71 grams per hectare (1 ounce per acre) and a split application rate of 71 plus 71 grams per hectare (1 plus 1 ounce per acre). The percentage control was noted to vary from seventy-eight to ninety-five percent with application rates of 282 grams per hectare (4 ounces per acre). Baron Kentucky bluegrass showed a much greater tolerance to chlorsulfuron treatments, with little effect noted at the 282 gram rate. The results indicate that chlorsulfuron has the potential for use as a selective - postemergence control of tall fescue in bluegrass turf.

THRESHING THE JOURNALS CONTINUED

THE FATE OF DIAZINON APPLIED TO THATCHED TURF

B E Branham and D J Wehner 1985

Agronomy Journal Vol 77 Number 1
pages 101-104

The plant-thatch-soil continuum has a major effect on the rate of dissipation of pesticides applied to turfgrass stands. Thatch is defined as a tightly intermingled layer of dead and living stems and roots that develop between the zone of green vegetation and the soil surface. In order to maximize the efficacy of pesticides aimed at controlling soil-borne insects, it is important to understand how soil properties and the presence of thatch affect the rate and avenues by which pesticide dissipation occurs. Diazinon is widely used to control turfgrass insect pests. A Kentucky bluegrass turf with and without thatch was used to study loss of Diazinon by volatilization, leaching and degradation. Most degradation occurred on turf containing thatch and irrigated daily. Only seven percent of the Diazinon remained after three weeks. Between thirty-two and forty-seven percent remained in either turf with thatch irrigated every four days or in turf without thatch. Most of the Diazinon [96 percent] remained in the top 10 millimeters [0.4 inch] of the turf profile regardless of whether this was thatch or soil. Where thatch is present, reduced control of insects is due to both a failure of the insecticide to move through the thatch and an increased rate of degradation.

A MICRO-ECOSYSTEM FOR FERTILIZER AND PESTICIDE FATE RESEARCH

B E Branham, D J Wehner, W A Torello and A J Turgeon 1985

Agronomy Journal Vol 77 Number 1
pages 176-180

Micro-ecosystems are useful tools for studying the fate of pesticides, fertilizer elements or related compounds applied to plant stands. The advantages of using these systems over field studies are that they are closed, allowing for total accountability of a compound and its metabolites and they facilitate studies with radioactive or potentially toxic materials. Research at The University of Illinois has resulted in the design of a micro-ecosystem to study the behavior of pesticides, fertilizers, or related compounds applied to plant stands including turf.

EFFECTS OF NITROGEN AND GROWING SEASON ON ROOT-RHIZOME CHARACTERISTICS OF TURF-TYPE BERMUDAGRASSES

G L Horst, A A Baltensperger and M D Finkner 1985

Agronomy Journal Vol 77 Number 2
pages 237-242

Root-rhizome growth responses of five bermudagrass cultivars in relation to shoot growth have been studied cooperatively by Texas and New Mexico Agricultural Experiment Stations. Differences in rate of decline during spring and increase during the summer growing season in root-rhizome organic matter were observed for common, Tifgreen, Santa Ana, Texturf-10 and an experimental cultivar FB-49. Tifgreen was the most responsive and common the least to changes in season and fertilizer nitrogen levels. Root viability of all cultivars increased during the spring, declined slightly during the summer and declined moderately during the second spring of the study. Nitrogen applications reduced the rate of this latter spring decline.

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

D A Potter, B L Bridges and F C Gordon 1985

Agronomy Journal Vol 77 Number 3
pages 367-372

Turfgrass is a complex system consisting of the roots, stems and leaves of grass plants together with a tightly intermingled layer of dead and living roots, stems and organic debris commonly called thatch. This habitat supports a diverse assemblage of invertebrates, including earthworms, nematodes, millipedes, oribatid mites and collembola. These are important to plant litter decomposition. They aid in the decomposition process by fragmenting and conditioning plant debris before further breakdown by microorganisms. They also disseminate bacteria and fungi, enrich the soil with their excreta and help to pull down and mix organic matter into the soil. A Kenblue Kentucky bluegrass turf treated with varying rates of ammonium nitrate fertilizer was maintained for study. Increasing the rate of nitrogen fertilization produced a decline in soil and thatch pH and in exchangeable calcium and potassium and caused an increase in thatch development. A decrease in earthworm density and biomass was noted as annual fertilizer rates increased. collembola were more abundant at an intermediate fertilizer rate. Acaridae were unaffected by nitrogen fertilization. Cryptostigmata were found to be the most abundant arthropod decomposers in the turf.

TALL FESCUE RESPONSE TO PLANT GROWTH RETARDANTS AND FERTILIZER SOURCES

L B McCarty, J M DiPaola, W M Lewis and W B Gilbert 1985

Agronomy Journal Vol 77 Number 3
pages 476-480

Roadside maintenance of tall fescue typically involves four to six annual mowings. In North Carolina mowing costs 7.5 million dollars annually. Growth retardants have been employed to suppress turfgrass shoot growth and reduce mowing frequency to lower maintenance costs. Mefluidide plus flurprimidol and maleic hydrazide treatments reduce cumulative turf height forty percent and suppress seed head formation up to ninety five percent for six to eight weeks. Mefluidide alone reduced turf height by twenty percent during this period. Fall fertilization of tall fescue improved turf color following spring growth retardant application. Turf response to fertilizer sources was equivalent, but higher rates of application improved color and increased turf height and seed head numbers.

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

R W Smiley, M C Fowler, R T Kane, A M Petrovic and R A White 1985

Agronomy Journal Vol 77 Number 4
pages 597-602

Thatch in turfgrass is the result of a long-term imbalance between rates of biomass [mainly crowns, rhizomes and roots] production and decomposition. The balance depends upon a complex interaction of plant growth characteristics and microbiological activities and micro-environmental conditions in the thatch layer. Tissue decompostion generally is initiated by fungi and they are succeeded by bacteria, then nematodes, and finally by larger members of the soil fauna. Mechanisms where by fungicides cause thatch to accumulate are being studied. Compounds that caused thatch to become deeper than in a nontreated control include: benomyl, cadmium succinate, fenamiphos, iprodione and mancozeb. None of the fourteen fungicides studied reduced the apparent rate of thatch decomposition of Kentucky bluegrass.

HEAT TOLERANCE OF KENTUCKY BLUEGRASS AS INFLUENCED BY PRE- AND POST- STRESS ENVIRONMENT

D J Wehner, D D Minner, P H Dernoeden and M S McIntosh 1985

Agronomy Journal Vol 77 Number 3
pages 376-378

An understanding of the natural variation in heat tolerance of Kentucky bluegrass is required to develop predictive models for stress tolerance. Adelphi Kentucky bluegrass has been tested and the dry weight of the stressed plants expressed as a percentage of the controls [recovery weight] used as a measure of heat tolerance. Heat tolerance increased from May to July and then decreased from August to October. Relationships between heat tolerance, day length and average low temperature for various sampling dates have been found.

Warvests 10

Director's Dialogue

(Editorial type commentary)

COLORING THE PUBLIC MESSAGE

by

Eliot C Roberts

The June 1983 issue of Lawn and Garden Marketing featured an article entitled "Shaping and Coloring the Public Message" by Wendall J Burns, Editor. It was concerned with how industry-supported groups produce food for thought for writers, broadcasters and other communicators and ultimately the consumer. Six associations and institutes were identified, including The Lawn Institute. In the past two years, the matter of coloring the public message has taken on new meaning.

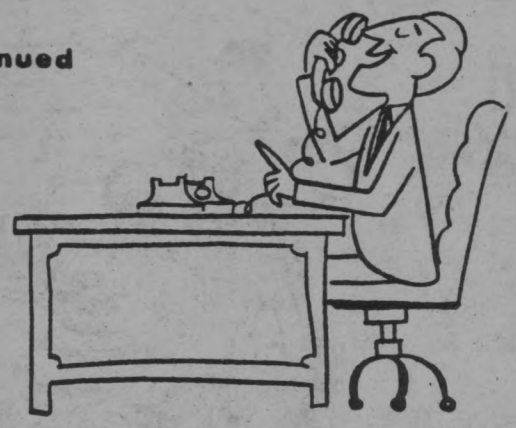
We recognize a wide variation in the attitudes of people towards lawns and gardening. They all have some traits in common-after all, they are people, but their aspirations as far as habitat, neighborhood, and community are concerned vary considerably. Our challenge is to color the message on lawns so that it is interesting, appealing, satisfying, urgent, quality of life related and easy to understand and follow through to a state of accomplishment. The basic, fundamental facts about lawns must be presented accurately and in line with reasonable expectations for achieving improved lawn quality. All this must be meaningful to the avid lawnsman as well as persons only marginally interested in lawn care.

A look through the buyers guides published annually by nearly all the leading lawn and garden trade magazines will reinforce the impression that there are a wealth of products - equipment, fertilizers, soil conditioners, pesticides and seed for use in establishing and maintaining a "perfect lawn". In fact, the choices are so wide that in many instances consumers are likely to be confused when deciding what products to use and what practices to follow.

Numerous organizations, including turf associations, grounds managers societies and lawn care organizations are actively providing assistance to their members. Books, trade magazines and other publications keep technical information updated and available for those professionals and amateurs with intense interst and high motivation. However, many home gardeners and others cannot or do not avail themselves of these informational sources and must rely on those who may help with a ready answer to any and all questions.

At this point, organizations like The Lawn Institute are up front- not only assisting through release of Press Kits and newsletters in advance of seasonal lawn stress, but also through follow-up along the way. From bermudagrass lawns in Tucson, Arizona overseeded with new turf type perennial ryegrasses to lawns in Medford Lakes, New Jersey established with these same perennial ryegrasses; from golf courses around Columbus, Ohio that feature some of the highest quality fine textured turf to school grounds and playfields in Crossville, Tennessee where concern is for safe play; from city parks for people in Denver, Colorado and Dallas, Texas to theme parks for tourists in Florida and California, the message comes through loud and clear. "Whatever the requirements of the client, or the conditions imposed by soil and climate, there are improved turfgrass cultivars to provide the best in groundcover and the most effective control of soil erosion." Finding the right information may seem like looking for a needle in a haystack. Needed information is there and The Lawn Institute is dedicated to helping people find it and put it to good use.

Director's Dialogue Continued



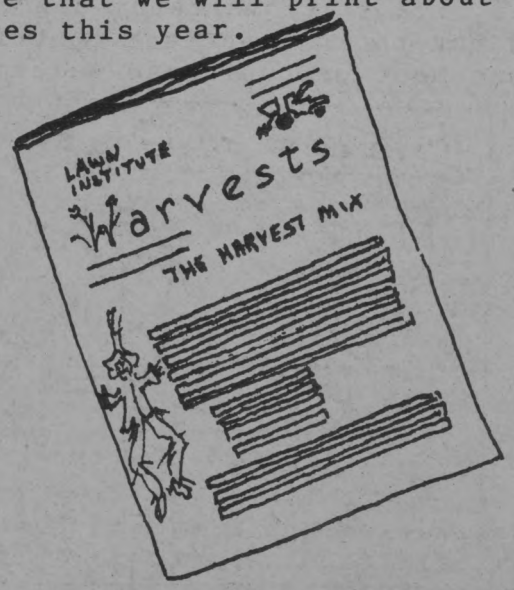
COLORING THE PUBLIC MESSAGE continued

We are concerned with the degree of frustration felt by many gardeners who have suffered along with their lawns. Letters call for "Help !" The accumulation of trash and litter in and around neighborhoods where lawns and gardens are non-existent is very evident. So often the call is for Clean up! It should be for Clean up and Green up !Sure, it takes a lot for plants to survive in many of these urban jungles, but for those who want bad enough, great improvements can be made.

During the past 12 months The Lawn Institute has been an organization on the GO. When we talk about Lawns Across America, we mean it as our public education effort extends from coast to coast and from north to south. During the past 12 months, 23 meetings were attended and 20 papers presented at conferences, workshops and seminars. Travel covered the continent from Atlanta, Georgia to Winnipeg, Manitoba and from Las Vegas, Nevada to Atlantic City, New Jersey.

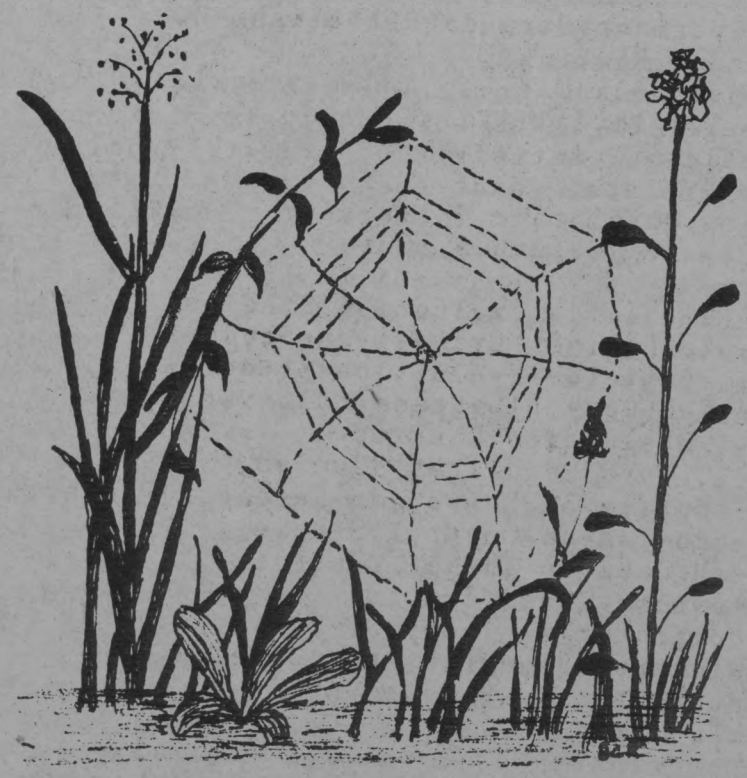
Not only the spoken word, but also the written word has helped color the public message. Thirteen articles have been published during the past 12 months - a little better than one a month. Of particular importance was the cover story, "Lawns Enhance the Environment" and the feature article "Lawnscape Horticulture" in the April 1985 issue of HortScience. Reprints of these were included with the Autumn 1985 Press Kit.

Press Kits mailed this spring and fall have generated a good response. And, Harvests has progressed from a dot matrix to a letter quality printer as a positive step forward in improving ease of reading. April Harvests contained 32 pages (8 more than normal). Expectations are that we will print about 100 pages in 4 issues this year.



Finally, there are two focus areas in which emphasis has been started. The first of these is improvement of playgrounds and sports turf across the country. The approach involves safe play on well turfed fields. An article in the June issue of PTA Today has introduced the topics to concerned parents and teachers. We have started to receive requests for information on the best grasses for playgrounds and sports turf. The second is the presentation of two day workshops for turf managers on the identification of turfgrasses and varietal uses. This new educational program is being developed with Dr Rich Hurley of Loft's Inc and is the outgrowth of a "Huntley-Brinkley" type presentation made by Hurley-Roberts at the Turf Conference in New Brunswick Canada a year ago.

In conclusion, watch a spider building his web. Every time it's destroyed, he builds it back just as it was. Over the years spiders have developed a perfect system for home and means for gathering food. We may never develop a system as satisfactory for us as the spiders' is for them. But, The Lawn Institute is doing its part in developing improved systems to make our habitats better and more satisfying. Lawns and gardens are important to us regardless of what kind of people we think we are. This has been so for thousands of years and will continue for generations to come.



Field Day Score Card

Turfgrass research field days at landgrant universities and at private research stations across the country provide an opportunity to keep up-to-date on turfgrass management technology. During the past season, field days in New York, Virginia, Ohio, Nebraska and Oklahoma placed emphasis on the following research:

-New York - Cornell University,
Ithaca, New York

Turfgrass Management
- Nitrogen Source Evaluation
- Soil Test Calibration
- Water Use Efficiency
- Cultivar Evaluations
- Wetting Agent Research
- Turfgrass Cultivation Studies
- Wear Tolerance

Disease Control Update
- Ring Spots, Patches and Frog-Eyes

Weed Control Update

Insect Control Update
- Diagnostic Tips

-Virginia - Virginia Tech
Blacksburg, Virginia

- Variety Trials - Sun and Shade
- Winter Covers on Burmudagrass
- Moisture Relationships on Turf
- Bentgrass Nutrition
- Dormant Bermuda Establishment
- Sod Rooting
- Bermuda Greenup and Winterkill
- Fungicide Trials
- Herbicide Trials

-Ohio - Ohio State University
Columbus, Ohio

- Herbicide Evaluation Studies
- Fertilizer Evaluation Studies
- Fungicide Evaluation Studies
- Kentucky Bluegrass Cultivar Evaluation Studies
- Growth Regulator Studies
- Update on Rhizotron Research Projects
- Poa annua Control Studies
- Update on Insect Control
- Grassy Weed Control in Kentucky Bluegrass
- Annual Bluegrass and Creeping Bentgrass Management Studies

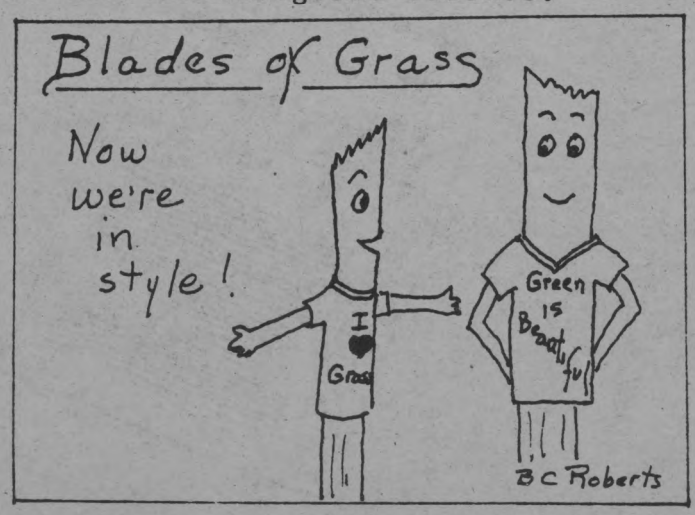
-Nebraska - University of Nebraska
Mead, Nebraska

- Kentucky Bluegrass, Tall Fescue and Perennial Ryegrass National Cultivar Trials
- Kentucky Bluegrass Breeding
- Tall Fescue Breeding
- Buffalograss Selection, Breeding and Management
- Broadleaf Herbicide Evaluations
- Wetting Agent Effects on Turfgrass Water Use
- Poa annua Control Studies
- Establishment and Mulch Studies
- Sprayer Calibration Techniques
- Turf Type Tall Fescue Management
- Postemergence Herbicide Evaluations for Crabgrass Control
- Preemergence Herbicide Evaluations

-Oklahoma - Oklahoma State University
Stillwater, Oklahoma

- Turf Establishment with Herbicides and Herbicide-absorbent Materials
- Preemergence Herbicide Trials
- Bentgrass Cultivars
- Fungicide Effects on Bentgrass Segregation
- Poa annua - Bentgrass Competition
- Bermudagrass Cultivars
- Cool-season Grass Cultivars in Shade
- Seedling Studies
- Growth Regulators on Bermuda and Seedling Grasses
- Bermuda Encroachment into Tall Fescue
- Initial Mowing of Annual Ryegrass Mixtures
- Tall Fescue, Perennial Ryegrass, and Kentucky Bluegrass Cultivars in Full Sun
- Perennial Ryegrass Cultivars Under Green-collar Conditions
- Fungicide Evaluations on Creeping Bentgrass

These five stations rate high on our score card for their important contributions to the advancement of turfgrass science.



P.O.BOX 108

(Industry Wide News and Views)

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PROCEEDINGS OF THE FIFTH INTERNATIONAL TURFGRASS RESEARCH CONFERENCE

From: R E Schmidt
Agronomist
235 Smyth Hall
Virginia Polytechnic Institute
and State University
Blacksburg Virginia 24061

Man's need for town-development never ceases, in well-developed countries as well as those undergoing development. Everywhere, man has a physical, psychic and cultural need to return to nature. Since historical times, this need arose together with a search for attractive landscapes, more or less intensive according to the period. All around him, carefully planned open green spaces, public or private gardens, and sports fields allow him to encounter all this with a feeling of security that the surrounding vegetation gives him. Today, in large modern cities, small green grounds act as a defense against pollution. Lawns serve equally to hold down the earth when cities are enlarged, fighting against suburb's mud and dust. Lawns help to heal the damage done to landscapes caused by highways and industry.

But to find a way to answer man's different needs, entails dividing this green wealth more and more between individuals and collective groups, right in a country and between countries, which in fact brings about a saving, in order to meet the huge demands already made or on the verge of being made. In this way, technology will bring about these savings, which is the aim of research on lawns on a world-wide scale, even if the demands have to be sometimes specified again or reduced. As early as the third Congress of I T S, J B Beard emphasized this aim.

This target is in action, it just requires a little speeding up. All subjects are concerned : we have to understand the physiology of plants better to control their nutrition and to specify the biology of parasites, and of their predators to find out what molecules are efficient and inexpensive; we have to reconsider the breeding methods and to determine more efficient measures in order to obtain persistent plants, producing fewer and hardy, etc.... More than ever, plants adapted to the mediterranean and tropical surroundings deserve to benefit from the efforts of research.

The acquired methods and those in progress on moderate lawn models constitute a scientific background which is available.

We must continue to support these researches as it is the only way to reply to rising needs, at the same time reduce expenses in order to allow lawn companies to be more dynamic.

I T S which was created years ago, is definitely necessary in encouraging exchanges between researchers, manufacturers and teachers. I T S is both a representative of intellectual fermentatic and also acts as a distribution agent. The reports of this Congress, as for the precedings ones, will have as many references for research in the future.

Editors note: These opening statements by P Mansat, I T S President, and F Lemaire, Editor, provide an introduction for this 870 page Proceedings. Ninety-four keynote addresses, research reports and papers are presented under the following seven topics:

- Breeding and Cultivar Evaluation;
- Establishment and Management;
- Soil, Irrigation and Plant Nutrition;
- Plant Protection;
- Herbicides and Growth Regulators;
- Physiology;
- Abstracts of Poster Presentations.

This research conference held in Avignon France in July 1985 assembled the world's leading turfgrass scientists. These Proceedings serve as a valuable update of turfgrass research on a global basis.

Dr R E Schmidt at Virginia Polytechnic Institute and State University can provide necessary information on how to obtain a copy for your reference.

TURFGRASS PEST MANAGEMENT MANUAL

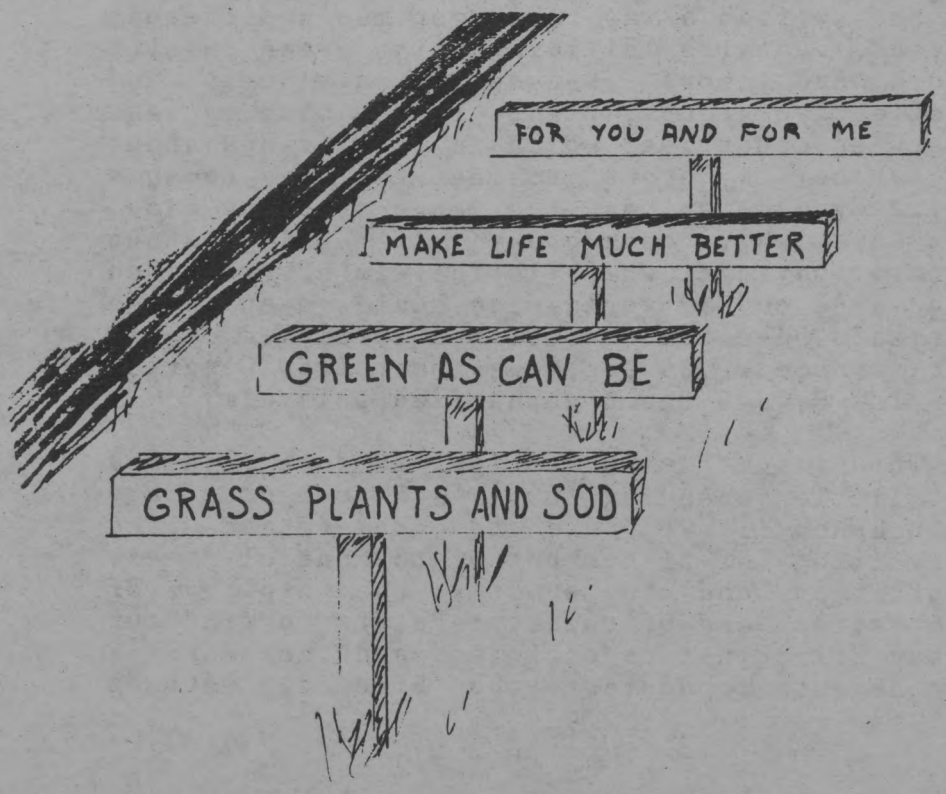
From: Arthur H Bruneau
Extension Specialist - Turf
Department of Crop Science
Box 7620
North Carolina State
University
Raleigh North Carolina 27695-7620

The causes of turfgrass problems are many and varied. Adverse soil conditions, improper cultural practices, environmental stress, chemical injury, planting of unadapted grasses and pest attacks are just a few of the possible reasons. Regardless of the difficulty at hand, correct diagnosis [defined as the investigation into the cause or nature of a problem] is the first step to be taken in correcting and preventing recurrence. Rapid and correct diagnosis can mean the difference between success or failure to a turf manager.

Regardless of the turfgrass problem, there are considerations that each turf manager must address to make a correct diagnosis. The turf manager must: 1] identify the turfgrasses being maintained and become familiar with their strengths, weaknesses and requirements; 2] know what the turf should look like when healthy to aid in early detection of problems; and 3] know the host plant to help pinpoint potential turf pests. A vegetative key is included in this field guide to help determine the grasses being maintained.

This guide will not insure correct diagnosis and control of all turfgrass problems encountered. It is designed to assist you in your plant management program and is only one of many resources available. Other resources include accurate and timely records, past experiences, fellow turf managers, turfgrass specialists and numerous publications. Workshops, clinics, field trips and conferences are excellent means of keeping abreast of the latest developments concerning plant and pest management. If you are uncertain as to what is the exact cause of a turfgrass problem, by all means obtain assistance from one of the sources mentioned earlier. One or more turf specialists, weed specialists, plant pathologists or entomologists may be required to correctly diagnose a given turfgrass problem.

Editors note: This 64 page booklet [AG-348] published by The North Carolina Agricultural Extension Service has been prepared by Arthur H Bruneau, Joseph M DiPaola, William B Gilbert, William M Lewis, Leon T Lucas and Robert L Robertson. It is available from Dr Bruneau at a cost of $5.00.



AN ECONOMIC SURVEY OF NEW JERSEY TURFGRASS 1983

From: Henry W Indyk
Extension Specialist in
Turfgrass Management
Rutgers University
Soils and Crops Department
P O Box 231
New Brunswick New Jersey 08903

Land-use patterns in Ne Jersey have shifted dramatically over the past 30 years. As the population of the state grew, the landscape changed from one characterized by cities and farmland to one dominated by suburban development. In the new suburbs, almost every aspect of land development involved the establishment and maintenance of turfgrass. Single-family homes, garden apartment complexes, schools, parks, and golf courses are a few of the areas that use turfgrass. In addition, the recent growth in the popularity of condominiums and townhouses has also led to significant increases in the stock of well maintained lawn areas.

Turfgrass is found everywhere in the Garden State. Perhaps because it is so ubiquitous, it tends to be overlooked, and the importance of the turfgrass industry in the state economy has not been recognized. There are no production or employment statistics published for lawn care and establishment as there are for other agricultural or industrial activities. The purpose of this study was to determine the economic importance of the turfgrass industry in New Jersey and to provide a data base for research and education planning to meet the needs of the various segments of the industry. Specifically the objectives were to estimate the turfgrass area and annual turf maintenance and establishment costs in the state.

Turner Price presented the following preview of survey results at New Jersey Turfgrass Expo 84:

- Lawns - 450,000 acres
  - 470 million dollars
- Golf Courses - 26,400 acres
  - 60 million dollars
- Cemeteries - 13,000 acres
  - 25 million dollars
- Parks - 62,500 acres
  - 38 million dollars
- Schools - 18,000 acres
  - 20 million dollars
- Multifamily residences -
  - 1,000 acres
  - 20 million dollars
- Churches - 11,000 acres
  - 16 million dollars
- Roadsides - 42,000 acres
  - 12 million dollars
- Institutional grounds -
  - 8,100 acres
  - 8 million dollars
- Airports - 3,500 acres
  - 2 million dollars
- Commercial Industrial -
  - 30,000 acres
  - 100 million dollars

Editors note: This 62 page report provides an excellent review of the nature of the turfgrass commodity in the most densely populated state in the country. Limited numbers of the report [New Jersey Agricultural Experiment Station P-02530-1-85] are available at a cost of $5.00 a copy. Requests should be directed to Dr Henry W Indyk.

TURFGRASS SLIDE SETS

From: Book Order Department
American Society of Agronomy
677 South Segoe Road
Madison Wisconsin 53711

The American Society of Agronomy offers eight slide sets as turfgrass management educational aids. These include:

The Botanical Characteristics of Turfgrasses

Color slides from across the nation explore the botany of vegetative grasses, regions of grass adaptation, and identification of cool and warm season turfgrasses and weeds. The set is designed for college and short course students, but is useful to anyone studying the identification of grasses primarily in the vegetative condition. A narrative is included. Set of 81 slides, 1978, SCCA. $30.00 [$31.00 outside the United States]. ISBN 0-89118-513-5.

Maintenance of Athletic Turf

This slide set introduces management practices that are useful in the maintenance of an acceptable level of turf quality on athletic fields. The set covers management overview, characteristics of athletic fields, unsuitable field conditions, fertilization, pest management practices, mowing, cultivation, irrigation, postgame repair and practice fields. A narrative is included. Set of 79 slides, 1985, CSSA. $30.00 [$31.00 outside of the United States]. ISBN 0-89118-520-8.

Roadside Turfgrass

These color slides illustrate many of the problems and solutions that typify roadside environments. The set describes erosion control, how to establish vegetation on roadside banks, treatment of roadsides with inadequate vegetative cover plus varieties used as roadside turfgrasses across the country. Division C-5 prepared this set. A narrative is included. Set of 80 slides, 1977, CSSA. $30.00 [$31.00 outside the United States]. ISBN 0-89118-511-9.

Diseases of Turfgrasses

This slide presentation, developed by Division C-5, focuses on the most common and widespread turfgrass diseases. The slide series, which includes a narrative, brings together essential information relative to the identification, nature, and control of the various fungus and nematode-incited turfgrass diseases. An additional booklet containing full color slide reproductions, also with narrative, will complement the slide set. [The full color booklet description follows]. set of 80 slides, 1977, CSSA. $30.00 [$31.00 outside the United States]. ISBN 0-89118-510-0

Color Booklet on Turfgrass Diseases

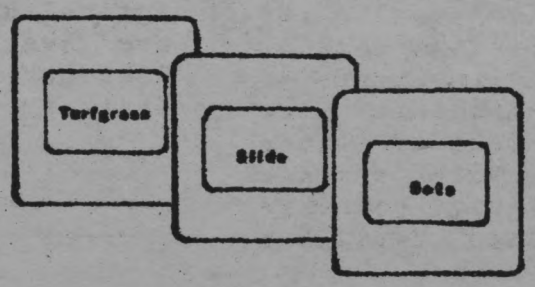
Slides are excellent in a classroom, but in the field they are useless. However, a full color booklet with narrative and containing reproductions of all the slides in the above mentioned slide set is available. This publication not only complements the slide set, but it can be used by itself as an excellent learning aid. Paperback, 28 pages, illus., 1968; CSSA. Price: 1 copy - $5.00; 2-20 copies - $3.85; 21-50 copies - $3.65; 51-100 copies - $3.40; over 100 copies - ask for quotation. ISBN 0-89118-510-0.

Cassette Tape for Diseases of Turfgrasses

Add to the Diseases of Turfgrasses slide set with this 20 minute narrative cassette. An excellent addition for classroom instruction. $5.00 per tape.

Microbiology of Turf Soils

This slide presentation is a simplified soil microbiology and biochemistry series that investigates the vast numbers, kinds and important activities of organisms which live in soils and particularly, turf soils. It is designed for high schools, junior colleges, and university plant production and plant science classes, turfgrass production and maintenance personnel, and lawn and garden clubs. A narrative is included. Set of 81 slides, 1978, CSSA. $30.00 [$31.00 outside the United States). ISBN 0-89118-512-7.



TURFGRASS SLIDE SETS continued

Thatch in Turfgrass

This slide set examines thatch in terms of physical and chemical components, beneficial and detrimental characteristics, cultural factors affecting accumulation, and available techniques for control. Current information reflecting state-of-the-art knowledge of thatch is presented. A narrative is included. Set of 71 slides, 1982, CSSA. $30.00 [$31.00 outside the United States]. ISBN 0-89118-516-X.

Soil Fumigation and Sterilization

This slide set was developed as a training aid for persons intersted in using chemicals for fumigation and sterilization. The slides deal with various chemicals used for different problems. A narrative is included. Set of 46 slides, 1979, CSSA. $20.00 [$21.00 outside the United States]. ISBN 0-89118-514-3.

Safety in Pesticide Application

Safety in Pesticide Application adds an important dimension to understanding and managing pesticides in turfgrass production. This slide set does not indicate which pesticide is best for use, but it does give instructions in obtaining help when such information is needed. A narrative is included. Set of 77 slides, 1979, CSSA. $30.00 [$31.00 outside the United States]. ISBN 0-89118-515-1.

These sets have been prepared by leading turfgrass scientists across the country and may be ordered through the ASA Book Order Department.

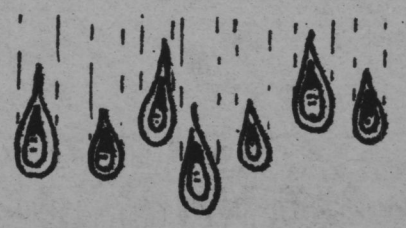
ARE YOU ALL WET ?

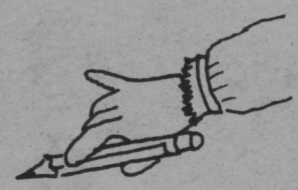
From: Bill Rhymes
Specialty Agricultural Products
Mallinckrodt
1007 Hidden Valley
Shelby North Carolina
28150

Imagine if you will, the mouth of the mighty Mississippi River as it empties into the Gulf of Mexico. While there is a main channel where most of the shipping moves, the river has broken up into many channels, all emptying into the Gulf. There is much marsh land and even completely dry land between these channels of water. Now, imagine a golf green, a garden, a flower bed or your yard, with rain or irrigation water falling on it. This water also channels down through the soil. There are wet area, damp areas and completely dry areas.

When a soil or other growing media wets slowly or nonuniformly, it is due to the physical properties of the soil as well as the water. Hydrophobic organic components of soil and a preponderance of capillary pore space combine to restrict the rate of water movement into such soils. Water's high surface tensions, due to strong cohesive forces, restricts movement into capillary pore space. The same physical forces that delay water movement into hydrophobic growing media or cause localized dry spots in turf also restrict or delay water movement out of wet spots, assuming the excess water has someplace to go.

The solution to both dry spots and wet spots is to increase the rate of water movement by providing a link between hydrophobic soil [or media] and hydrophilic water. Surface-active agents [surfactants] sold as soil wetting agents should do several things; 1] decrease water's surface tension; 2] facilitate water movement into dry soils; 3] remain adsorbed onto the soil colloids after drying to effect rewetting; 4] facilitate drainage from areas prone to stay wet, and 5] have a wide safety margin on plant material.





ARE YOU ALL WET ? continued

Perhaps no other type product used in turf and ornamental industries causes as much confusion and misunderstanding as surfactants. Such names as detergent, dispersant, wetting or rewetting agent, penetrant, cleaner, spreading agent and emulsifier most often describe the action or result desired and are, as such, not descriptive when distinguishing between one and another. For instance, a detergent is also an effective wetting agent.

Rather than labor these names, it is sufficient for the professional turf and ornamental manager to recognize those products developed <u>for</u> wetting soil/artificial growth media. Have you attended any major turf or ornamental trade shows recently ? If so, you probably saw or were told about several soil wetting agents and why a particular one was the "best on the market". Should you use one, and if so, which one and why ? Here are some guidelines:

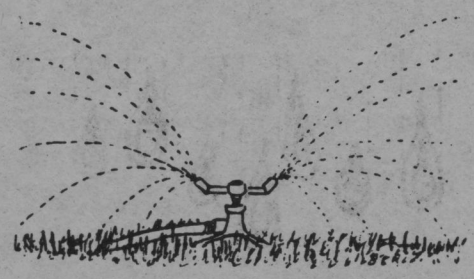
1. Don't buy water. Many products have very little active ingredients in them [some as low as 5%] and the rest is water. Initial cost per gallon is low, but they may not last but a few days in the soil.

2. Buy one that is all-wetting agent, i.e., 100% active ingredient. These are by far the most economical as only one or two applications are needed per growing season.

3. Buy one that has a history of success and consistently ranks at the top in university and experiment station tests.

4. Talk to other superintendents and growers. Many are using these good products and they'll be glad to tell you why they do and their product of choice.

5. When using, soil wetting agents must be <u>well watered in</u> [using a liquid type] or uniformly mixed with the soil [using a granular type]. Left on the plant surface, they can be phytotoxic.



Here are some benefits to you for using a good soil wetting agent:

- <u>TURF</u>

  * Dew elimination for several days following application may aid in disease control.

  * Fewer dry spots, fewer wet spots.

  * Less hand watering to correct for dry spot, giving conservation of water and manpower.

  * Soils able to absorb moisture more rapidly during heavy precipitation.

  * Less stress on treated fairways, greens, etc - wilting less severe.

  * Encourages stronger, healthier turf by helping water soak into and spread more evenly through the soil.

- <u>ORNAMENTALS</u>

  * Prevent plant loss under dry or wet weather conditions.

  * Treated soils [or soilless mixes] wet rapidly - less runoff.

  * Wets and drains the root zone uniformly.

Lastly, we generally think of the major benefit of using a good soil wetting agent as better use of available water. This does happen. However, of equal or perhaps greater benefit is that other chemical soil additives are uniformly distributed for maximum efficacy. Remember the opening paragraph about the Mississippi River and the dry areas between the channels ? Our wetting agent has done away with these dry areas in our soils. Therefore, our fertilizer, soil fungicides, soil insecticides, soil herbicides, etc, are spread out evenly, and the plant root system gets a uniform "dose" of not only water but these expensive chemicals as well.

Wetting agents don't cost you money ! They make money for you. Your turf and plants have responded better to all soil additives; hence, they are healthier. You have done a better job, in less time, and have saved money and manpower in many ways. You are more secure as a professional. You find you are not "all wet", just "wet enough".

Editors note: Use of wetting agents on turf is of increasing importance. Bill Rhymes experience with these materials is of interest and his tips worthy of consideration.

Lawn Institute Pitch

(Discussion of Current Issues)

Warvests 19

FOLIAR FEEDING

FRIEND OR FOE ?

by

JAMES H BOYCE

Consulting Agronomist

Ottawa Ontario Canada

The answer to the question posed in the title of this article can be quite simply stated - it all depends on how you use it - a not unfamiliar factor in determining whether a particular deed will make a friend or an enemy. There can be no denying that liquid fertilizers applied as sprays can be quite useful in the turf maintenance program provided they are properly applied at the correct time and for the right purpose. Neither can it be denied that the indiscriminate and prolonged use of such fertilizers can result in utter disaster. It was the observation of several such disasters on a number of golf courses in the province of Quebec during the late summer of 1984 that prompted the preparation of this article. Recently acquired information that the promotion of the spray application of fertilizers is about to be greatly increased has emphasized the urgency of the situation and made it essential that the information contained herein be placed before the turf managing public at the earliest possible date. It is hoped that it will help turf managers to avoid similar catastrophies in the future.

It is universally accepted among turfgrass agronomists that the most important part of the grass plant is the part that we do not normally see - the root. If a deep, healthy root system can be maintained in a turf, the top will pretty well look after itself with minimum assistance from the turf manager. Unfortunately many of the practices that we follow, particularly that of close mowing, tend to reduce the development of the root system, thus making the turf susceptible to all forms of environmental stress and requiring maximum attention by the turf manager to nurse the sward through stressful times. Hot weather worsens the situation because it further causes root reduction.

If a person injures an arm and has it placed in a cast or sling for an extended period, the muscles in that arm become atrophied and the arm withers to the point that, when it comes out of the cast or sling it is practically useless, because of disuse, and it requires much exercises and probably physiotherapy to restore the tone and strength of the muscles. If a grass plant is continually fed through the leaves it has no further use for the roots and because of this dususe the roots wither and die to the point that they become non existent. We haven''t discovered how to exercise or apply physiotherapy to roots so the plants must get along without them until root - regeneration time in the cool fall weather. Unfortunately it is usually too late by the time cool weather arrives since a turf without roots is unable to withstand any other environmental stress be it heat, drought, disease or any of the many other things that can happen and usually do occur during our stress-filled summer months. The result is dead turf and the consequent necessity of replacing it either by seeding or by sodding.

There are many advantages to the spray application of fertilizers, not the least of which is the fact that one can apply compatible pesticides, fungicides, herbicides, wetting agents and other materials along with the fertilizer thus reducing significantly the total amount of labour that would be involved in applying each of these materials separately. This is what appeals most to turf managers who are charged with the responsibility of growing the best possible turf at the lowest possible cost. This in turn is responsible for the continuous use of liquid fertilizers in spray form by otherwise excellent managers who do not realize what they are doing to the root

FOLIAR FEEDING - FRIEND OR FOE continued

systems of their turfed areas. The resulting damage will occur on any turf continuously treated in this manner but appears first on intensively managed areas such as putting greens where extremely close mowing has already reduced the amount of root development to the bare minimum required for survival. The damage is usually sudden, frequently overnight, and what the day before was a beautiful piece of turf is suddenly yellow to orange in colour and quite dead in appearance. The amount of money required to replace this turf soon uses up any that was saved in making multiple applications in a series of one-spray treaments. The amount of revenue lost in reduced play, lowered public opinion and loss of memberships in incalculable.

Root reduction in foliar feeding is further influenced by the fact that nutritional imbalance is created by more rapid absorption of nitrogen than of phosphorus. The role of the latter element in root development is well known.

The question arises as to when foliar feeding may be practised to the advantage of the turf. Since the response of turf to foliar feeding is much more rapid [often overnight] than it is to dry applications to the soil it is most frequently used as a "shot-in-the-arm" treatment when the turf must be prepared quickly for a particular event or time. It is also useful when the need for an element, particularly a micronutrient, is acute. In the case of heavily compacted or water-logged soil conditions, foliar application of fertilizer will help sustain the turf until these conditions can be corrected.

In short, use foliar feedings to nurse turf through trying and stressful circumstances. But make sure the backbone of your fertilizer program is based on the application of dry fertilizers balanced to the particular fertility requirments of your soils, as determined by quantitative analyses. And never under any circumstances use foliar applications continuously in fall and early spring when root development should be at its peak.

Continuous and exclusive use of liquid fertilizers in spray form will eventually result in the destruction of turf, first on greens, then on tees and finally on any other turfed areas treated in this manner on a golf course. Even lawn-type turf is not immune to the "no root syndrome" caused by exclusive use of foliar feeding which will ultimately result in loss of turf and costly re-establishment practices.

Editors note: These observations by Dr Boyce are well in line with research results reported by Norman MacLeod in 1958. A University of Massachusetts Master of Science Thesis entitled "A Comparison of Liquid and Solid Fertilizer for Turf" was among the first in the United States to be presented in response to questions raised by oil dealers who wanted to spray liquid fertilizers on turf in the "off season".

Conference Topics

(Presentations of note)

MISSOURI LAWN AND TURF CONFERENCE

ST LOUIS
NOVEMBER 1984

Dr Harry Niemcyzk

Ohio State University
Columbus, Ohio

Of all areas of turfgrass management, insect control often seems most complex. This is usually the result of insect life cycles that must be understood and accurately evaluated in order for control to be effective. Dr Harry Niemcyzk has presented the following approach to turf insect control.

- Consider three different ways to deal with insects:
  * Preventive- Use chemicals at regular intervals regardless of insect activity. This is expensive and likely to contaminate the environment with pesticides.
  * Predictive- Use chemicals only after evaluating the activity of insects to make certain the timing is right.
  * Curative- Use chemicals only after there is insect damage to the turf.
- Many turf managers follow a Treat-Look-Wait sequence before trying something else.
- The following key factors influence insect control practices:
  * Budget for control;
  * Turf management standards;
  * Turf Manager or Superintendent role as communicator;
  * Knowledge of Turf Manager or Superintendent-
    - History of market area and pest problems therein;
    - Pest life cycles;
    - Diagnostic ability;
    - Pesticide characteristics.
- Pesticides
  * Short residual materials;
  * Long residual materials.
- For grubs:
  * Triumph - isazophos;
  * Oftanol - isofenphos;
  * Proxol - trichlorfon.
  * There is not likely to be 100 percent control; more like 73 to 96 percent control. Pesticides move down to where grubs are in irregular paths. There are always some survivors. Applications in August should yield close to 90 percent control. Use - Turcam; Mocap; Ethoprop; Diazinon. Low concentration granular materials often permit better distribution. Dursban - chlorpyrifos is restricted in its movement through thatch. Triumph [CIBA Geigy Corporation] will be registered in the near future. This is a curative material of short residual like Diazinon. Grub prevention is in order April through July using Oftanol at a rate of 2 pounds active ingredient per acre or Milky Spore Disease.

Conference Topics Continued

INSECTS continued

* Grub curative treatments may be made in August using:

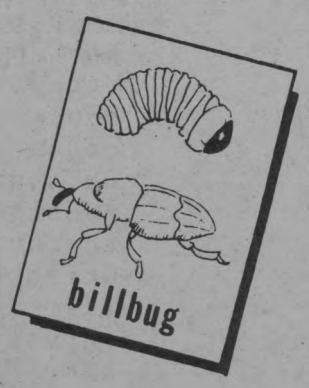
  - Oftanol - 2 pounds active ingredient per acre;
  - Mocap - 2 pounds active ingredient per acre;
  - Proxol - 8 pounds active ingredient per acre;
  - Turcam - 2 pounds active ingredient per acre;
  - Diazinon - 5-6 pounds active ingredient per acre.

* In September use:

  - Proxol- 8 pounds active ingredient per acre;
  - Turcam - 2 pounds active ingredient per acre;
  - Diazinon - 5-6 pounds active ingredient per acre.

- For Ataenius:

  * Treat when spiraea comes in full bloom. Syringe after treatment. Check to see that control has been obtained using Diazinon.



- For cutworms and sod webworms that hide during the day and feed at night, there are many effective insecticides. These should not be watered in. Repeat treatments in 2 to 4 weeks are advised as a thorough cleanup is seldom obtained. Treat main target area as well as surrounding area so that they will not creep back in. Treat in the evening - not in the morning. The insect will come to the surface to feed. That is where the insecticide should be. Spray 4 gallons per 1000 square feet or 2 gallons per 1000 square feet for high pressure sprayers.

- For billbugs and chinchbugs:

  * The billbug works on Kentucky bluegrass and zoysia, chewing at the base of the stem. Chinchbugs inject into the grass plant some foreign materials that damage the tissue. Hot and dry weather are ideal for these insects [mid July and August usually]. Preventative control for billbug may start in May using: Oftanol- 2 pounds active ingredient per acre.

  * For curative control use:

    - Proxol - 8 pounds active ingredient per acre;
    - Turcam - 2 pounds active ingredient per acre;
    - Diazinon - 5-6 pounds active ingredient per acre.

  * For preventative control of billbug and chinchbug, use:

    - Dursban - 1 pound active ingredient per acre;
    - Diazinon - 2.5 pounds active ingredient per acre.

  - Treat in late March to early May.

UPDATE ON ARSENICALS

Dr Ray Freeborg

Purdue University
Lafayette Indiana

For many years, turfgrass scientists at Purdue University have been at the forefront of research on herbicidal properties of arsenic compounds. Dr Ray Freeborg continues this tradition with this comprehensive update.

- Arsenic compounds are used effectively for the prevention of crabgrass and for the control of annual bluegrass.

- Calcium and lead arsenates are used in granular [varying in particle size and density and thus in rate of breakdown] pelleted and powder forms.

- Some arsenic materials are relatively soluble, others insoluble.

- These are hazardous materials to use because of the poisonous nature of arsenic.

- Grasses vary in tolerance to arsenic from most to least in the following order: bluegrass, bentgrass, ryegrass, fescue, goosegrass, annual bluegrass, crabgrass, chickweed.

- Use of arsenic for annual bluegrass control is of continuing interest because of the many different annual bluegrass types. Some more perennial types are less susceptible to arsenic control. These are often the more stoloniferous types.

- Residual properties of arsenic compounds are important in building up soil levels that can bring about annual bluegrass control. Three year residual activity is not uncommon.

- Phosphorus content of the soil affects arsenic activity. High phosphorus levels result in less control of annual bluegrass with arsenic.

- Tricalcium arsenate is being used to keep annual bluegrass out of bluegrass and bentgrass fairways. Where the basic turf is thinned some, slit seed in more tolerant grasses, such as the new turf type perennial ryegrasses.

- Annual bluegrass control often takes from 18 to 24 pounds of lead arsenate per 1000 square feet or 12 to 18 pounds of calcium arsenate.

- As days shorten in the fall and there is less light intensity, there is an increase in arsenic activity. Also, cloudy days with wet soils enhance the activity of arsenic. Annual bluegrass goes out very rapidly under these conditions.

- In addition to low levels of soil phosphorus, a soil pH of from 6.0 to 7.5 is desirable for best results.

- When arsenic is being used, the basic grass should be as healthy as possible. Thus, heights of cut should be set at reasonable levels - 3/16 to 1/4 inch for golf greens; 1/2 inch for fairway turf. Where heights of cut must be lower than these standards, use less arsenic per application.

- Arsenic toxicity to annual bluegrass is accumulated slowly within the soil. Start with less than the total amount needed and add more with time. Where a gallon is required for total control, start with a pint or quart.

Conference Topics CONTINUED

UPDATE ON ARSENICALS continued

- A Ten Point Program has been recommended for use of Tricalcium Arsenate [Turf-Cal] for control of annual bluegrass:

1. Drain low wet areas so that soils are moist but not wet.
2. Lime to create a soil pH of 6.0 to 7.7.
3. Withhold applications of phosphorus in the fertilizer program.
4. Remove thatch and reduce soil compaction as much as possible.
5. As required, slit seed perennial ryegrasses into weakened basic turf; repeat the seeding operation at frequent intervals so as to maintain live grass as the annual bluegrass goes out.
6. Make applications of tri-calcium arsenate in late summer or early fall. As the annual bluegrass discolors from the first application, add a bit more until from 1 to 1 1/2 gallons per 1000 square feet has been applied. In this way an adequate level of arsenic toxicity is established within the soil.
7. Maintain arsenic toxicity by adding 1 pint to 1 quart per 1000 square feet per year.
8. Watch for control of annual bluegrass when light intensity is low. At these times, injury should be conspicuous.
9. Liquid phosphorus applied at a rate of 1/8 to 1/4 pound P_2O_5 per 1000 square feet may be sprayed on turf as needed.
10. Where it may be necessary to remove other weeds and grasses besides annual bluegrass, glyphosate [Roundup R] may be used followed by reseeding. New formulations of arsenic may be used at 2 quarts per 1000 square feet. This burns foliage of all living vegetation. Reseeding is necessary following such treatment.

- Turf-Cal [Mallinckrodt] is a flowable calcium arsenate for turf.

NEW JERSEY TURFGRASS EXPO-84

ATLANTIC CITY
NEW JERSEY
DECEMBER 1984

TURFGRASS ESTABLISHMENT IN HEAVY WEAR AREAS

Dr Henry Indyk
Rutgers University
New Brunswick New Jersey

New Jersey claims the distinction of being the most densely populated state in the United States. This fact alone probably contributes to extensive turfgrass use and heavy wear. Dr Henry Indyk has accumulated years of experience dealing with turf wear and suggests the following as important for your consideration.

- Turf cover provides an element of beauty within the landscape. It prevents the formation of dust and mud and it provides safe footing for those who traffic upon it.
- Turf provides a cushion that helps reduce athletic injuries. The egg drop test demonstrates the value of turf. On black top, an egg will break when dropped 3 inches. On poor thin turf, the break comes at about 5 feet. On good dense turf, it takes a drop of some 15 feet to break an egg.

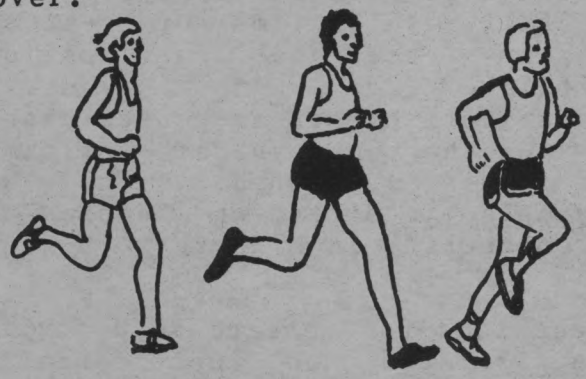
Conference Topics CONTINUED

TURFGRASS ESTABLISHMENT IN HEAVY WEAR AREAS continued

- There's no question - most sports fields are used too much to make turf production easy. Athletic competition plus bands contribute to distinctive wear patterns.

- What is an acceptable limit of use for sports turf ? On some fields, 3 events are too much; on others 40 events are not too much. Much depends on soil properties which are different in various fields.

- What about soil differences ? Soil textures and structure or degree of aggregation have an effect on how easily soils become compacted. In mineral soils, there is a mixture of particles. Organic matter will account for 0.5 to 5.0 percent; mineral matter amounts to 45 to 50 percent; and air and water should occupy 25 percent each. Dry soil is hard; wet soil is soft. Use of fields when wet squeezes out the air and increases the relative proportion of water, mineral and organic matter. Turfgrasses grow only with difficulty under these conditions, leaving weeds to take over.



- Drainage is the key since wet soils are soft and compact easily. Soil drainage is a complex matter involving such factors as:

  * infiltration of water into the soil;

  * water holding capacity of the soil;

  * root development and activity of organisms within the soil.

- Turfgrass top growth is never better than its root growth. The reason goosegrass and knotweed take over where turfgrasses fail is related to improved root development of weeds. Unfortunately, weeds do not produce a playing surface suitable for athletic competition.

- What can be done to make sports turf better:

  * Meet fertilizer needs of turf.

  * Correct soil pH by use of lime. Note that at a pH of 3.6 there are no roots; at a pH of 7.1 there are good roots.

  * Improve soil aeration by coring.

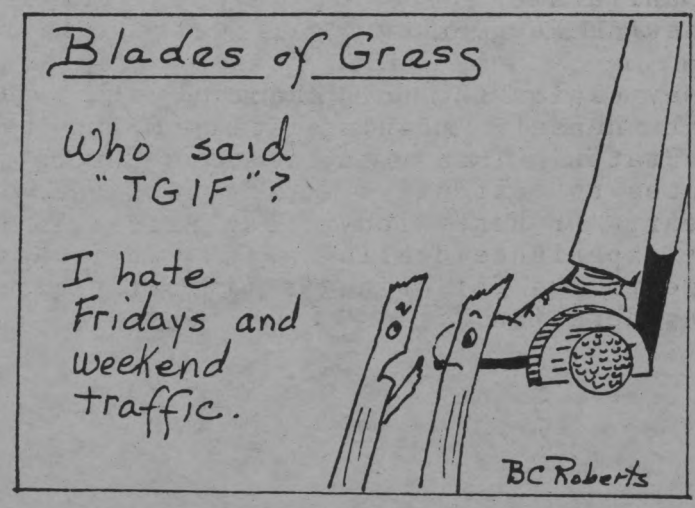
  * Avoid topdressing with sand and miracle products.

  * Vertigroove the surface and seed. Note seed germinates and becomes established in the grooves.

  * Seed perennial ryegrasses and turf type tall fescues. Note these grasses are quick to establish, drought tolerant, resist soil compaction. These grasses make good pure turf stands. They will also help modify hard compacted soil.

- What is most difficult to do ?

  * Correct surface and internal soil drainage. This requires more than a simple renovation. Soil physical properties and field grade need to be changed and/or drainage tile installed. At times, this is necessary in order to create favorable conditions for turfgrass root growth.



How Herbicides Work or Don't Work

Dr Tom Watschke
Pennsylvania State University
University Park Pennsylvania

An understanding of how herbicides work will help make them more effective in turfgrass management. Dr Watschke emphasizes the following points:

- Active plant growth is needed for a high degree of herbicide activity.
- The following conditions promote favorable results from herbicides:
  * leaves with a minimum of cuticle;
  * plants with active transpiration;
  * favorable light, temperature, humidity, rainfall and wind.
- Rate of herbicide application is important. It must be just right. Too little and there is poor control; too much and a chemical burn may result that stops translocation of the chemical throughout the plant. This is necessary for complete control.
- Uniformity of spray is necessary for satisfactory control. Calibration of the sprayer, agitation of material in the tank, poor overlap patterns, nozzles not working properly, improper speed and the wrong pressure in the system contribute to application deficiencies.
- Herbicides are intercepted by the leaf. The spray drop comes in contact with a wax covering then the cuticle proper and continues on to pectin layers, primary cell walls, secondary cell walls, plasma membranes and into the cytoplasm. Movement of the chemical is by diffusion. It must be retained on the leaf in order to move into the plant.

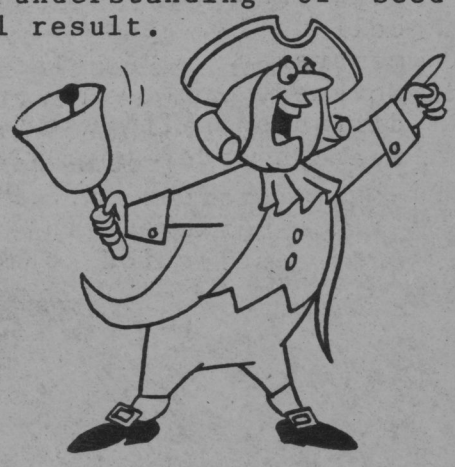
- Both reception by the leaf and retention by the leaf are of critical importance. The inherent wettability of the leaf surface makes a difference. So does the surface tension of the spray solution. Both of these influence foliar absorption.
- Herbicide losses by way of drift which may take the chemical away from part of the target zone and produce an overdose elsewhere, volatilization of the chemical or removal by rainfall are responsible for poor weed control.
- Once the herbicide enters the plant through absorption, it is translocated through the plant by active and by passive means. The sink is associated with carbohydrate needs of the plant in flowers, stems and roots. Translocation to the root would be most desirable. Since most turf weeds do not flower in the fall, this time of year is most likely to encourage translocation of an herbicide to the root. The transpiration stream moves herbicides upward; the photosynthate stream moves herbicides downward. The symplast [cytoplasmic streaming] causes cells to be connected, in effect.
- Mechanisms for escape or detoxification are related to the formation of insoluble salts that may accumulate in vacuoles adsorbed to cell walls. Higher concentrations of herbicide at the time of application can help overcome detoxification. Rates of herbicide application take this into consideration. There may also be some excretion by the root system.
- Active herbicidal compounds attach vital processes at the molecular level. Cellular sensitivity depends some on photosynthesis, respiration, nitrogen metabolism and enzyme activity. When herbicides accumulate in the right place, they attach vital processes that produce the desired effect.

WHAT'S NEW IN TURF ?

Dr C Reed Funk
Rutgers University
New Brunswick New Jersey

When E F Hutton speaks, people listen. When C R Funk speaks, there is much to hear regarding what's new in turf. Dr Funk suggests that we should be aware of and consider the following:

- Attributes of an improved turfgrass cultivar:
  - * ease and economy of establishment;
  - * attractive appearance; even unique;
  - * tolerant of shade, wear, poor soil, close mowing, climatic variables.
- Remember: Joe Valentine - 1936 - Merion bluegrass - U S Golf Association - US Department of Agriculture - Pennsylvania Agricultural Experiment Station - worldwide evaluation - seed production - available as an improved turfgrass in 1950. All this stimulated a new effort and the production of some 70 million pounds of seed.
- The demand for turfgrass is ever present. Don't forget - conservation, utility, safety, beauty.
- Demands on turfgrass quality are increasing.
  - * Bermudagrasses and perennial ryegrasses wear better.
  - * Ryegrass mowing quality is improved.
  - * Zoysias may be the answer for low fertility locations.
  - * Slower growing grasses are needed for reduced mowing.
  - * Low water use ~~grasses~~ are needed for improved drought tolerance.
  - * Increased herbicide tolerance is important.
  - * Endophytes increase insect resistance in ryegrasses and in tall and fine fescues. Sod webworm, billbug and chinchbug resistance means a lot in quality turf production.
  - * Puccinellia distans and Paspalum vaginatum are both intersting from the standpoint of salt tolerance.
  - * Some ten million pounds of ryegrass, fine fescue and Poa trivialis seed is used annually for overseeding.
  - * New bluegrasses have improved resistance to diseases - Helminthosporium and stripe smut. More improvement will be forthcoming for brown patch in turf type tall fescues. Ryegrasses have improved rust resistance.
  - * Improved insect and disease resistance means less turf damage that is open for weed encroachment.
  - * Turf type tall fescues and perennial ryegrasses do not produce thatch and this benefit is worthy of note.
  - * New turfgrass cultivars are selected for improved seed production. This helps make turfgrass seed an even better buy.
  - * Issues related to seed control regulations and seed certification are being openly discussed so that an improved understanding of seed quality will result.



Conference Topics CONTINUED

WHAT'S NEW IN TURF continued

- The collection, preservation and use of turfgrass germplasm resources is on the increase. New breeding approaches involving biotechnology, genetic engineering and tissue culture are of increasing importance.

- Breeding bluegrasses involves:

  * selection - apomixis

  * mutations

  * hybridization -

    -interspecific,

    -intraspecific

Sexual reproduction is concerned with:

  * reduced egg and pollen;

  * fertilized egg;

  * reflection of both parents in the new plant.

- Apomictic reproduction is concerned with:

  * seed produced asexually;

  * non-fertilized egg;

  * seedling like mother plant.

- Following the selection of promising plant types from field locations, the following steps are involved in the development of a new cultivar:

  * establish field nurseries;

  * collect and process seed;

  * establish turf plots [50,000 small plots at Rutgers];

  * evaluate turf differences under stress, such as mowing;

  * produce seed and increase as foundation seed.

  * For example: Adelphi Kentucky bluegrass started with a selection in 1964. A hybrid was developed in the greenhouse in 1965. Trials started in 1965 and seed finally marketed in 1972 [8 years from selection to marketing].

- Bentgrasses, fescues and ryegrasses are mainly cross-pollinated. These grasses are:

  * genetically heterozygous;

  * possess hybrid vigor;

  * feature segregating progeny;

  * feature great genetic diversity.

- Breeding cross pollinated turfgrasses involves:

  * selection of ecotypes from the field;

  * production of a synthetic variety;

  * production of a first generation hybrid;

  * vegetative propagation may be necessary, such as with bentgrasses, zoysiagrasses, and Warrens A-20 bluegrass.

- Breeding synthetic varieties involves:

  * field selection of clones;

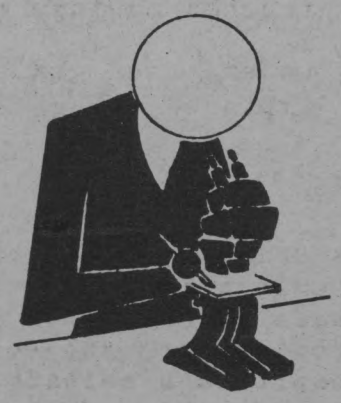
  * evaluation of clones;

  * testing combinations of clones under turf conditions;

  * making final selections based on turf quality;

  * production of breeders foundation and certified seed.

- Grasses like tall fescue that have larger numbers of chromosomes are complex and take more breeding time. Rebel turf type tall fescue took a long time to develop and has contributed to the germplasm of several other cultivars. Ryegrasses with fewer chromosomes can be improved in less time.



GROWTH REGULATORS

Dr Tom Watschke
Pennsylvania State University

University Park Pennsylvania

Plant growth regulators present a complex area of study. Delivery system technology is of critical importance. It must be even more precise than that required in pest management. With materials like Embark, rates of application of 1/4 to 1/2 pound per acre are standard. With new materials, rates of 1 to 2 grams per acre will be required. Dr Watschke has made the following observations concerning plant growth regulators:

- Annual bluegrass provides a good example of growth regulator possibilities:
  * kill the plant;
  * make slow growth;
  * control seedheads;
  * create stress tolerance.
- Seedhead inhibition:
  * Thirty years ago maleic hydrazide was used;
  * Now with Embark 85-95 percent seedhead control is possible when applications are properly timed;
  * There may well be 15 to 17 thousand annual bluegrass seed per square foot of fairway soil; thus, any reduction of new seed is worthwhile;
  * Also, seedheads are objectionable to look at. If this phase in the plant life cycle can be eliminated, annual bluegrass may be more useful;
  * Soil temperature and genetic make-up of different annual bluegrass plants influence seedhead formation;
  * Experience dictates that treatments should not be made too early. At these times slow growth that is frosted or subject to cold can result in a setback;
  * In order to recognize this narrow window for application, treat only after the second significant mowing;
  * Some minor discoloration on bentgrass tees and greens should be expected following treatment;
  * During seedhead formation, rooting is generally reduced. Use of the growth regulator should result in better roots as seedhead formation is suppressed. This allows the photosynthate to be used at other locations within the plant, like the roots. Better root development gives the annual bluegrass a better chance to survive heat and drought stress.
  * Cell division occurs at each meristem. It may take 4 to 6 weeks for root growth to pick up following treatment.
  * When drought stress is evident within about 3 1/2 weeks following seedhead inhibition, there is usually little effect of the growth regulator on the stress. When the stress comes after about 4 weeks, there is a reduction in stress related injury to the annual bluegrass.
  * Stand conversions to other grasses following seedhead inhibition is desirable. Overseed with perennial ryegrasses that feature rapid germination and seedling vigor.
  * Cutless [Elanco] is a different type plant growth regulator than Embark. It does not affect cell division but cell elongation. It is soil absorbed and is effective on seedling competitive vigor. Growth after germination of the seed is different. Ryegrass is not as restricted in seedling growth as annual bluegrass. Thus, Cutless may be used effectively to convert from an annual bluegrass to a ryegrass turf. Cutless does not inhibit seedheads, but produces a shorter flower stalk that tends to stay well below the cutting height. Since Cutless interrupts the natural gibberellic acid effect on plant growth, gibberellic acid may be used to reverse the effects of Cutless. In effect, this serves an an antidote.

High School & College Students –

Are You Interested in

TURFGRASS SCIENCE CAREERS ?

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30

BECAUSE OF PRACTICAL EXPERIENCE AND INTEREST IN PLANT SCIENCE

An appreciation for working out-of-doors, the challenge of creating and the responsibility of maintaining beautiful surroundings, the opportunity of working closely with nature and living plant material, close association with sports and sportsmen, particularly as applied to golf, are all key phrases in describing the type of experience which often leads to a career in fine turf work. Professional golfers and caddies, because of their familiarity with the game of golf and golfing conditions, often become interested in college courses of study in turf management. Others enter this field of specialization as a result of summer employment on golf courses, parks, athletic fields, cemeteries or municipal and industrial grounds. Many who have not had such experience select turfgrass management because previous studies have indicated a general proficiency in applied plant science.

BECAUSE OPPORTUNITIES FOR EMPLOYMENT ARE EXCELLENT

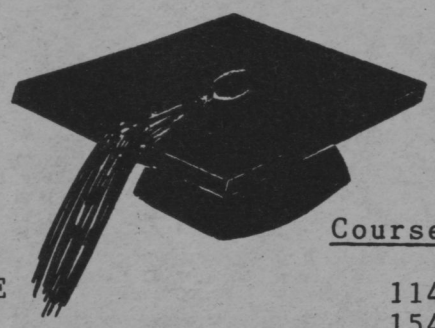
Skilled supervisors and assistants for parks, cemeteries and playgrounds are in demand. College training is required for positions in turfgrass management at many golf courses. Cities and large towns and many industrial corporations offer positions to men and women who have good backgrounds in plant and soil science and who have specialized knowledge in the care of flowers, shrubs, trees, lawns and other turfed areas. Expansion and new development of parks, play fields and golf courses as well as beautification of new business and commercial sites has increased the demand for specialists in turfgrass maintenance and will assure the need for large numbers of replacements in the years ahead. In addition, airports, military installations and highway departments often require the services of turfgrass specialists. Men and women with college training and sufficient practical experience are needed to fill positions in these areas.

For those who have completed the requirements for the BS degree and are interested in college teaching and research or in commercial product development and research, opportunities for graduate study towards the degree Master of Science or Doctor of Philosophy are good.

SPECIALIZATION IN TURFGRASS MANAGEMENT OPEN TO MAJOR STUDENTS IN DEPARTMENTS OF AGRONOMY AND HORTICULTURE

Because of the beauty of fine turf and its universal use in lawns, parks, cemeteries, athletic fields and golf courses, it may be classified as ornamental as well as functional. Turfgrass finds wide and extensive use as a ground cover for airfields, military installations and roadsides, and for special soil conservation work. Major students in departments of Horticulture or departments of Agronomy may find careers in turfgrass management of interest. Course requirements related to specialization in Turfgrass Management are about the same in both departments, and the opportunities for employment are equally good. Both departments offer electives in addition to the core requirements. Students desiring to graduate in Agronomy will want to take additional courses in soils and in range and pasture management so that opportunities in soil conservation, grassland management and related seed industries may be open to them. Students majoring in Horticulture, on the other hand, will wish to take additional courses related to flowers, trees, shrubs and landscape management so that opportunities in garden center operations or related landscape Horticulture supply industries may be open to them.

The four-year university course of study in Turfgrass Management includes subject matter designed to provide a technical background in turfgrass culture at such a level that you may qualify for the Bachelor of Science degree. Major course work includes credits in Turfgrass Management, credits in Agronomy [including Soils, Crops, Fertilizers, Plant Breeding, and Agricultural Meteorology] and credits in Horticulture [including studies of the use, management and propagation of flowers, trees, shrubs and evergreens]. Additional requirements for graduation include credits of Botany [including Plant Physiology and Pathology], credits of English and credits of Chemistry. Course work in Agricultural Engineering, Zoology, Physics, Genetics, Bacteriology, and Mathematics also is required. Economics, Psychology, History and Government often rounds out the schedule of required courses. Twenty courses, offered by various departments of instruction, are listed as suggested or desirable electives. Students interested in teaching and research are advised to take electives in basic science in order to prepare themselves for continued study at the graduate level.



OPPORTUNITIES TO GAIN EXPERIENCE

Summer employment in Turfgrass Management is encouraged. An effort should be made to place qualified students regardless of amount of practical experience on golf courses or other locations where first hand experience in this field may be gained. For those students who can qualify, an opportunity is offered to work during the Spring and Summer [on full or part-time basis] on the turfgrass research plots at many land grant universities. Additional part-time work is available during the academic year in greenhouse and laboratory experimentation for those sufficiently well prepared to be of assistance in these research activities.

POSITIONS FOR WHICH YOU MAY QUALIFY

Graduates may be considered qualified for positions as Assistant Superintendents and full Superintendents of large acre turfgrass establishments. It is recognized that the maturity of an individual rather than age is the factor which, when allied with technical competence, determines ability to assume a Superintendent's responsibility. Openings also are available as Turfgrass Specialists in industrial corporations. Commercial concerns which make and distribute commodities used in turf grass management rely on trained personnel to keep their products up-to-date and in popular demand.

EXAMPLE OF COURSE OFFERINGS FOR STUDENTS SPECIALIZING IN TURFGRASS MANAGEMENT

Courses in Turfgrass Management

	Quarter Credits
Turfgrass Management [Agronomy 313 or Horticulture 313]	3
Turfgrass Management [Agronomy 314 or Horticulture 314]	3
Special Problems in Turfgrass Management [Agronomy 550 or Horticulture 510]	6
Seminar [Agronomy 411 & 451 or Horticulture 401 and 403]	2
	14

Courses in Agronomy

	Quarter Credits
114- Principles of Field Crop Production	3
154- Soils	4
206- Agricultural Meteorology	3
334- Pasture and Forage Crops	3
354- Soil Fertility	4
424- Principles of Crop Breeding	3
453- Fertilizers	3
473- Soil Survey	4
485- Agro-Microbiology	4
	31

Courses in Horticulture

	Quarter Credits
114- Principles of Horticulture	3
154- Greenhouse Methods	3
214- Plant Propagation	3
244A-Garden Flowers	3
305- Landscape Service	3
316- Nursery Management	3
490- Ornamental Systematics	5
	23

Courses in Botany

	Quarter Credits
101- General Botany	3
202- General Botany	3
310- Elementary Plant Physiology	4
306- Taxonomy	4
216- Weed Identification and Control	4
407- Principles of Plant Pathology	4
424- General Plant Ecology	3
	25

Scientific and Technical Courses

	Quarter Credits
Algebra & Trigonometry	6
General Chemistry	4
General Chemistry - 2	4
Organic Chemistry	5
Elementary Zoology	5
Agricultural or Horticultural Entomology	4 or 5
General Bacteriology	5
General Genetics	3
General Physics Laboratory	1
General Physics	4
Soil & Water Management	3
	45

Courses in English, Social Science and Humanities

	Quarter Credits
Principles of Composition 1,2,3	9
Business Correspondence	3
Speech Making	3
General Psychology	3
Principles of Economics 1,2	6
American Government	3
Elective	7
	34

Note: On the semester system, fewer courses are generally offered and graduation requirements vary.

FOR MORE INFORMATION

For more information on major courses of study throughout the United States and Canada and for answers to your career oriented questions, write to Eliot C Roberts, Director, The Lawn Institute, P O Box 108, Pleasant Hill, Tennessee 38578. Phone 615/277-3722.

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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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