LAWN INSTITUTE

Harvests

Volume 29 Number 4 January 1983

CONTENTS

THE HARVEST MIX

(AN INTRODUCTION TO THIS ISSUE
OF HARVESTS)

The last issue of Harvests represented a first in that it featured a new format and was the inaugural issue from our Pleasant Hill office. This Volume 29, Number 4 issue also presents a new look - tabloid rather than mimeograph. Also, it is now being distributed to an expanded mailing list.

Our goal continues to be that of presenting information concerning turfgrass cultivars and lawn seed as related to all aspects of the fine turf industry.

We are pleased with this current step in the development of an improved communications process, and dedicate this issue to a more complete understanding of current turfgrass research and practice.

This issue of Harvests will not include:

-Director's Dialogue (Editorial on Lawn Institute and related topics)

-Readers Forum (News and views)

-Score Card (Presentation of research data and conclusions from turfgrass fielddays and conferences)

-Research Synthesis (Analysis of research reports and interpretation of results)

Look for these in Volume 30, Number 1 (April 1983)

Presentations from Agronomy's Diamond Jubilee meeting in Anaheim, California, November 28- December 3,1982 and from the Oregon Seed Growers League meeting in Portland, Oregon, December 6 and 7 are featured in this issue.

Lawn Institute Pitch

(CURRENT OUTREACH BY WAY OF
THE WRITTEN AND SPOKEN WORD)

LAWN SEED FIT FOR A GLOBAL MARKET

For more than twenty five years I have served on the academic faculties of four land grant universities in three different regions of the country. This opportunity to "sell" young people specialized training in turfgrass management in an educational environment has been most satisfying. In addition, through Extension Education, professional grounds managers and home gardeners alike have been exposed to a "selling" of concepts and practices that produce the best in quality turfgrass cover. In these instances, the "selling" didn't involve an exchange of monitary funds. It did involve an art of letting other people have my way- the benefit of up-to-date turfgrass technology.

Perhaps it seems obvious that current technology should need little "selling". Not so. New ideas and practices resulting from turfgrass research require "selling" in much the same way that lawn seed must be sold. What is there about lawn seed in 1983 that gives us confidence that it is fit for a global market ? How should we approach this matter of selling - again, the art of letting the consumer have your seed ?

There are three areas of focus in considering this matter. First, it is appropriate to look at our product - high quality seed. Is it worthy of the claims we make for it ? Second, we must know the market. What are the current market characteristics ? What past and present economic conditions have determined these characteristics ? What are consumers telling us of their needs for lawn seed ? And third, continuing public education is a prerequisite to consumer satisfaction in lawn and sports turf use. How may we be able to best meet public needs for information required in making sound lawn and gardening decisions ?

Lawn Institute Pitch

CONTINUED

QUALITY SEED

In 1982 the American Society of Agronomy celebrated its 75th anniversary and in 1983 the American Seed Trade Association will have achieved 100 years of service. Thus, the development of quality lawn seed and the formulation of practices that maximize the genetic potential of the seed have been topics of continuing research and education for many years.

Within the past ten to fifteen years, as high technology has become a reality in this country, significant breakthroughs have occurred in use of germplasm, in understanding the genetics of turfgrass species and in the development of new varieties. The result has been the release of new, improved cultivars. Field plot evaluations from all over the world prove that these new grasses are superior to older types in a broad range of growth characteristics.

Thus, high quality is a reality and yet the ultimate is still not yet in sight. More improved cultivars are in the making. In anticipation of this, the American Seed Trade Association has recommended policies for release of germplasm, varieties and related technology from public institutions. These recommendations are designed to help maintain the close cooperation between public and private plant breeders that has been so important in making past accomplishments.

Seed laboratories are of critical importance in the maintenance of high quality seed products. In addition to purity and germination tests, information on seed quality is available from weight measurements, X-Ray studies, viability tests, bioassay, tetrazolium tests, chromosome studies, variety determinations and moisture measurements. Quality control is, in fact, a reality for the lawn seed industry.

Without presenting more detail, we are confident that the seed grown for lawn use is a high quality product. Seed growers see to that. Thus, it is apparent that the formulation of seed mixtures becomes the limiting factor in utilization for a wide range of intended purposes. A nation wide sampling of lawn seed mixtures available indicates that up to half are not well suited for use in the region sold. Many of these mixtures are relatively inexpensive and so meet a valid market demand. They are not likely to generate continuing consumer satisfaction; however, they often satisfy a need for quick, though temporary, cover. Our overall marketing system is designed to supply products where sales potential exists. This is a sound system. However, public education is required to emphasize the fact that the better buy is the mixture containing a quality blend of improved grass types.

We still hear the saying that originated back in 1938 when Elmer Wheeler wrote the booklet Sentences That Sell, that is, "Sell the sizzle, not the steak". Richard J Ferris, Chairman and Chief Executive Officer for United Airlines has an editorial entitled "You Can't Sell The Sizzle Without the Steak" in the December 1982 issue of United. He places sound emphasis on the fact that it takes quality to bring about repeated sales. Just as it takes a quality steak to sell, it takes quality lawn seed mixtures to bring consumer satisfaction regardless of the amount of "sizzle".

A BASIS FOR MARKETING

Yesterday, today was the future; today, tomorrow is our future. The future, as near to us as tomorrow, or as distant as next year, is affected most by two factors over which we have some, though limited, measure of control. The first is concerned with the environment and relationships between environment and energy. The second is based on public values that determine standard of living, life style and quality of life. Marketing of lawn seed is accomplished within limits set by these factors since they vary to some degree from place to place around the world, the concept of a global market presents opportunities in one place that may not be feasible in another.

ENVIRONMENT/ENERGY RELATIONSHIPS

The topic "Energy Shortages and Changing Life Styles" has been discussed in recent years, perhaps most completely by Clark C Abt of Abt Associates, Boston, Massachusetts. Energy policy affects the common behavior of most people with respect to activities in which they spend most of their time. It influences the places at which they live, work, study and find recreation and entertainment. Further, energy policy must take into consideration the possible impacts on life styles, because conditions that change people's quality of life are likely to be politically sensitive.

We live at a time of energy transition from familiar, well accepted sources to new unfamiliar and even perhaps hazardous sources. Regardless of the outcome of this transition, life styles are changing and will continue to change. These changes may tend to place higher priority on the neighborhood, and on local environmental quality as we become at least somewhat less mobile. In this instance, lawn grasses have a high priority task to perform.

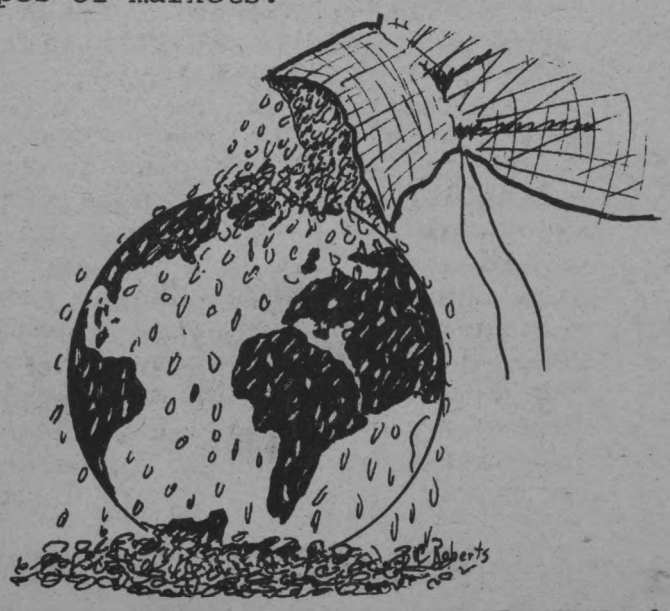
Lawn Institute Pitch

CONTINUED

PUBLIC VALUES

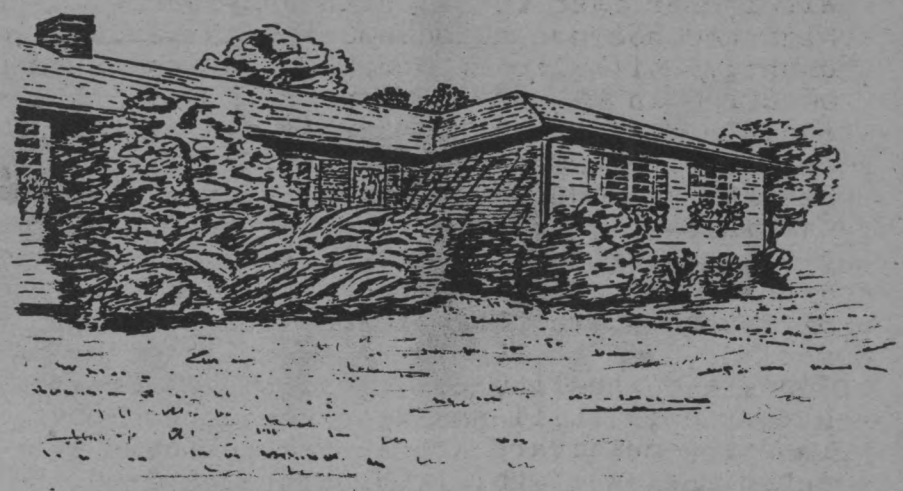
Public values are simply the composite of individual personal values so focused that one perspective becomes dominant over the others. They vary with location and are determined by the attitudes of people living and working together. Dr Morris Massey of The University of Colorado has produced an excellent video tape entitled "What We Are Is Where We Were When". Essentially, what I am as a person, what I value most, depends on where I was and on the condition of those times when I was most influenced in the formation of values. Circumstances which influence values are well understood; the influence of family, friends, church, schools, media, music, geography, income are among those most important. Values that include respect for the environment, responsibility for individual action and appreciation of natural systems are likely to result in projects involving landscape horticulture. Mere survival is not likely to be satisfactory for these persons.

Ever since 1967 when Dennis Gabor's book entitled "Inventing the Future" received major attention, we have been more positive in our approach to planning for the future. Planning at the corporate level, planning at local, state and national levels all have emphasized an analysis of past conditions, current aspirations and projected values and needs for the development and maintenance of pleasing habitats. With the advanced degree of technical competence available to us, inventing the future is within our grasp. Articles like "Ecotopia Now" by Sim Vander Ryn, San Francisco architect in New Age Magazine are indicative of the creativity that is part of the process. And if Herman Kahn, Director of the Hudson Institute in New York is correct in his new book, The Coming Boom: Economic, Political and Social, the United States may be on the verge of a period of tremendous revitalization that could begin as early as this year, and last twenty or more years into the future. The lawn seed and fine turf industry are ready now for involvement in these types of markets.



MARKET DETERMINANTS

In addition to environment/energy relationships and public values influences, the lawn seed market is determined,to some degree at least, by three trends that have developed slowly during the past decade. These include: first, the concept that plants enhance both functional and esthetic environments; second, the increasing realization that human/plant proximities produce psychological and healing benefits for the gardener; and third, the prospect for improved understanding of the politics of landscape horticulture.



PLANTS TO ENHANCE THE ENVIRONMENT

Fifteen years ago, a joint task force of the U S Department of Agriculture and the State Universities and Land Grant Colleges described "A National Program of Research for Plants to Enhance Man's Environment". This report served to emphasize the interrelatedness of herbaceous flowers, shrubs, trees and turfgrasses in the residential landscape. The concept of ornamental horticulture as a blend of the arts and sciences created new excitement in the use of landscape plants.

Plant culture is a learning experience based on principles of plant and soil science, one that is challenging, enjoyable and satisfying. Use of plants involves architecture, design and artistic concepts. The gardener is provided with a unique opportunity for creative expression, regardless of the size of the property involved. Variations in color, texture of foliage and size of plant material help focus attention within the garden and, in addition, may form linkages with neighboring landscapes. Lawn grasses provide a basal plane ground cover that can be creatively designed with zones of fine or coarse textured types and even used to create walks and boarders among other broadleaved ground covers. Integrated use of all types of plant materials opens up new opportunities for creation of lawns and out of doors living space. In so doing, it stimulates both the scientific curiosity that is within us and the latent artistic genius that makes each of us a special person.

Lawn Institute Pitch

CONTINUED

HUMAN PLANT PROXIMITIES

Twenty years ago, Professor Patrick Horsbrough of The University of Notre Dame presented a paper at the winter conference of the Indiana Association of Nurserymen entitled "Human-Plant Proximities: A Psychological Imperative". Published in Indiana Nursery News, Volume 33, Number 4, this article brought into focus for many of us what we perceived to be an indescribable benefit from close association with living vegetation.

The old notion that the purpose of landscape plants was simply a matter of beautification never has been really very satisfying. Beauty is in the eye of the beholder and what may be attractive for one, may not be so for another. Thus, the time was right for a different approach. Professor Horsbrough described how the simplest physical factor of 'Human-Plant Proximities' was related to the most complex emotional consequences of human-plant relationships. He suggested that a psychological imperative existed that required all of us to work towards environmental enhancement as the artificiality of our surroundings becomes ever more oppressive. When we realize that the alternative to human-plant proximities is the desert, and that this may be viewed as either or both African desert or any inner city desert, it becomes more obvious that in the healthy state of selected vegetation lies the evidence that any place is fit for human habitation.

In 1974, Professor Albert E Griffiths of The University of Rhode Island traveled 19,000 miles through the United States and Canada on sabbatical leave. His mission was an evaluation of the art and science of Horticultural Therapy. He interviewed over 100 professional therapists, doctors, sociologists, hospital administrators, teachers and clients. He inspected programs at over 40 universities, training schools, correctional institutions, half-way houses, sheltered workshops, state hospitals and VA hospitals. His report documented what the League of Federated Garden Clubs have known for many years; i.e., the therapeutic value of horticultural plants is real.

Perhaps something about the fragile and dependent nature of ornamental plants makes the patient desire to protect and nurture them and in so doing, gain strength and satisfaction.

What's in it for us in the lawn seed industry ? We are an integral part of the human-plant proximity/therapy process. Lawns, as essential parts of the garden environment, generate power for better living.

POLITICS OF LANDSCAPE HORTICULTURE

As we are more and more getting away from the old concept of ornamental plants as luxury items, we realize the potential for building political (public) support for landscape projects on a wide scale. Now, it is certain that there is a recognized hierarchy of human needs, and that not all people in any given region of the country or part of the world have made adequate advances in meeting the most critical needs for food, shelter, clothing, and security, among others. Nevertheless, this age we live in is certainly more advanced worldwide than any that preceeded it. Our standard of living and quality of life are higher than ever before.

By placing emphasis on the value of the landscape in real estate enhancement, and as a significant community asset in creating green belts, encouraging population dispersion, promoting wildlife conservation, controlling soil, water, air and visual pollution, and providing grounds for recreation, public support for plants to enhance the environment is a political reality.

From field burning in the seed production regions of the country, to water conservation practices for lawns in drought prone regions, to new emphasis on low maintenance lawn care practices, public awareness of issues and solutions continues to be an urgent political need.

CONTINUING PUBLIC EDUCATION

The means by which we look for information are changing. The national newspaper USA Today is based on satellite technology and television format. It is perhaps a last chance for readers who rely on newsprint of major city papers. In fact, it appears that we have so taken to TV that this means may well be our major source of information used in decision making. Cable TV and the prospect of sets that are programmed for retrieval of computer and video tapes on a wide range of topics,from regional landscape recommendations to installation and care of lawns, may well be close at hand. Computer programming for turf maintenance is already with us. The software is available for use in Cooperative Extension Education and also in garden center retail outlets. Now is the time for the development of educational strategies for lawn seed fit for a global market.

The quality product is available; market characteristics are sound; consumers are increasingly sensitive to the importance of plant use in the landscape. The close of the twentieth century is rapidly becoming known as an era of advanced communications. The stage is set and the curtain is going up. Our performance as a landscape industry is awaited by an eager audience. It looks to me like a good show is about to begin.

Association and Society Reports

(PRESENTATIONS BASED ON KEYNOTE ADDRESSES)

Agronomy's Diamond Jubilee, 1907-1982, was celebrated by The American Society of Agronomy and affiliated Societies in Anaheim, California, November 28 through December 3. The theme, " 75 Years of Progress in Integrating the Soil - Water - Air - Plant System for Mankind", applied equally well for turfgrass as for food and fiber crops. Fifty eight papers concerned with turfgrass research were presented by scientists from all regions of the United States.

At a special session, Dr Nyle C Brady, Senior Assistant Administrator for Science and Technology, AID, Washington, DC and Dr David W Dibb, Southeast Director, Potash and Phosphate Institute, Atlanta, Georgia, discussed Agriculture's Science Based Revolution and Agronomic Systems for Feeding Generations to Come. The following review of these presentations focuses on application of principles presented to turfgrass science.

TURFGRASS SCIENCE - A SYSTEMS APPROACH

The past 75 years have featured remarkable advances in all aspects of science. Agricultural science and agronomic science in particular have provided technical leadership in all areas of scientific endeavor.

The initial 43 American Society of Agronomy members in 1907 have increased to some 12,000 members in 1982. During this period changes in farm productivity have been noted. An average yearly productivity increase of 0.2 % for farmers was common up to about 1940. At that time a seven fold increase in productivity occurred. Agriculture's science based revolution was under way.

New levels of confidence developed in research, in recommendations from research, in business and in commerce. The private sector component gained vitality and Agribusiness became a reality. The seed industry was among other agricultural leaders.

Medical science also made key contributions during this period. As life expectancy increased, population increases followed. Food needs increased and in this country we have been able to keep supply equal or better than demand. The cost has been a smaller percentage of expendable personal income than anywhere in the world. With all of this has come a higher standard of living and a more satisfying quality of life for most Americans.

LAWNS AND SPORTS AND RECREATIONAL ACTIVITIES ON LIVE GREEN GRASS CONTRIBUTE TO QUALITY OF LIFE

Among those quality of life criteria of greatest significance have been access to and first hand experience with lawns, gardening and related out of doors activities concerned with sports and recreation on live green grass. The concept of plants to enhance our environment has become a reality and we recognize more and more the importance of this in developing and maintaining community respect and pride in accomplishment.

We have been able to make these advances because new practices have come from scientific achievement. New knowledge concerning soil and water relationships; chemical, physical and microbiological functions of the soil environment; the critical importance of soil organic matter, particularly as related to the efficiency in use of mineral nutrients by plants; and the genetic basis for hybrid vigor and use of advanced breeding techniques in the development of new varieties has all helped to provide practical improvements in the way we grow and use plants of all types.

Given this level of achievement, what is there left to be done, particularly in the area of Turfgrass Science ? All indications are that the surface has barely been scratched. The past 75 years have provided an excellent base upon which to make continuing advances. The whole concept of low maintenance turf is a challenge to science for new grasses and new management practices that are more cost effective.

TURFGRASS GERMPLASM FOR MAXIMIZED ENVIRONMENTAL STRESS TOLERANCE

The genetic potential is there; germplasm must be utilized to produce cultivars with maximized environmental stress tolerance. Past research with the objective to merely improve yields and desirable growth characteristics is now thought to be outdated. New emphasis on maximizing both yields and essential growth characteristics is focusing new light on current research.

Space age technology has lead us to believe that all things are possible. Sights can now be set on maximum yields and highest quality. Through team research effort and a systems approach methodology, expectations for meeting research goals should be high.

THE SYSTEMS APPROACH
FOR POSITIVE INTERACTIONS

Research on systems that involve genetic engineering, plant engineering, rhizosphere technology and plant growth regulators must be designed to produce positive interactions. Quality turfgrass cover is always the result of interactions between plant and soil and climate as influenced by the genetic potential of the plant under the influence of a wide range of possible cultural practices.

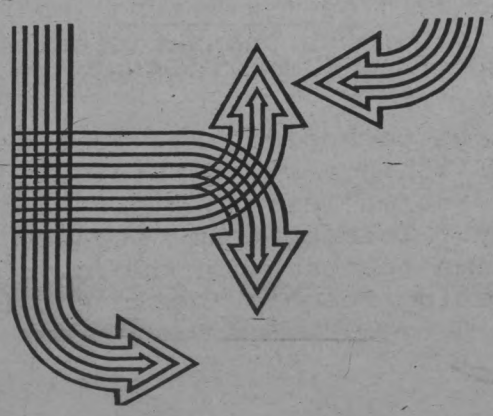
The current resource of available technology can be put together in new ways that create more positive interactions. In addition, new technology can contribute when placed in line with existing technology. The key is involvement with systems rather than with isolated factors as has been the case with much of our past research emphasis.

ECONOMIC PRACTICALITIES
AND SETTING OF RESEARCH GOALS

Finally, although it is extremely difficult not to let economics affect the determination of research goals, this temptation must be resisted. We must know how turfgrasses grow before we can maximize practices that show us how to grow them. We realize all too well that economic benefit comes from knowing how to grow turfgrasses. Thus, the more fundamental research needs leading to practical recommendations are an essential prerequisite.

If we follow the example set in the development of the memory calculator, the economic issues will be solved following the birth of the idea and its realization in substance. Twenty years ago this type of calculator did not exist; ten years ago they were used by scientists and mathematicians; and now most households have one at the cost of $10.00 or less. The idea was sound and although the product was expensive to begin with, it is now one of the best buys on the market.

A systems approach for turfgrass research is already underway at several stations. Integrated pest management research is a definate step in the right direction. It is certain that turfgrass science will continue to keep pace with agronomic science during the next twenty five years. Where there is a critical need for new information, a systems approach method will find it and make it functional in our enjoyment of all turf and lawngrasses.



P.O.BOX 108

(COMMENTARY FROM THE MAIL)

A Turf Management Computer Program

From: J Benton Jones, Jr, President,
Benton Laboratories, Inc
P O BOX 5455
Athens, GA 30604

"Small home-type computers are coming into greater use with an ever widening array of applications in business, science and agriculture. As a first of its kind, the user can now apply computer technology to the business of TURF MANAGEMENT, and at a low cost. Designed for a wide range of uses, they are-

- information source on turf
- lawn and garden shop customer assistance
- guide for professional turf manager
- written instructions for maintenance workers
- education in turf management

This computer program provides information for 6 common turf species (bluegrass, bentgrass, fescue, perennial ryegrass, bermudagrass, zoysiz, St Augustine grass and centipede) and includes the following -

SPECIES CHARACTERISTICS tolerance to shade, temperature, drought, salinity and wear

CULTURAL REQUIREMENTS mowing height, optimum soil pH and fertilizer requirements

ESTABLISHMENT recommendations for seeding or sprigging, and time of planting

LIME & FERITLIZER RECOMMENDATIONS recommendations based on past treatments, level of turf appearance and performance desired

WEED CONTROL chemicals recommended for control "

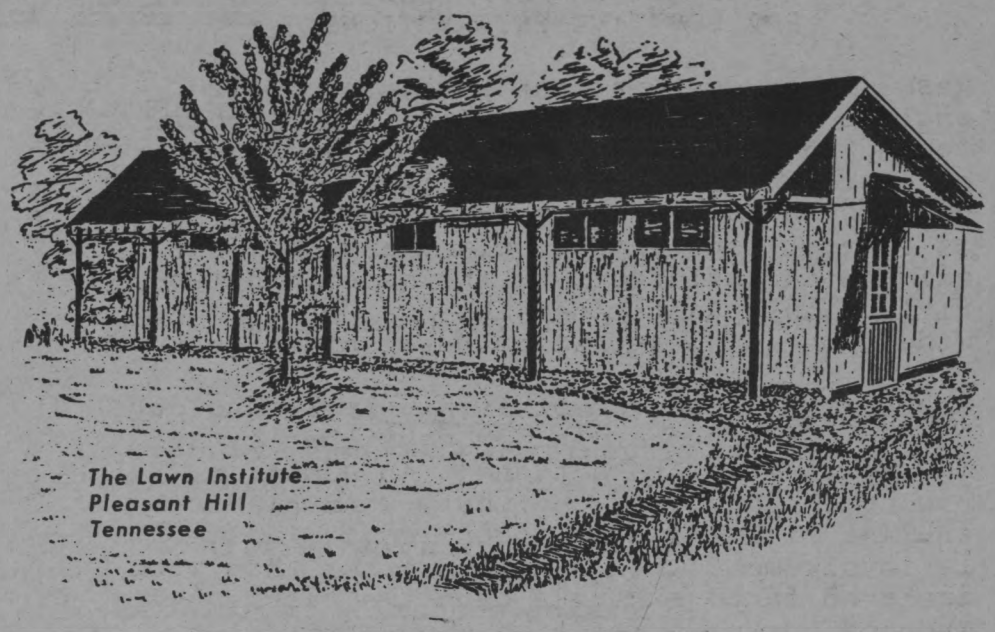
P.O.BOX 108

CONTINUED

1982-83 Gardens for All Survey

From: Nancy Flinn
The National Association for Gardening
180 Flynn Ave
Burlington, VT 05401

"Over one half of American households -44 million of America's estimated 82.4 million households- grew food for their tables in 1982..... Home and community vegetable gardening is a growing way of life spread across nearly 2 million acres, comprised of dooryards and checkerboard plots..... Eighty six percent of all Americans are involved in at least one gardening activity from lawn care to flower gardening ..... Lawn care included 63 % of American households..... Vegetable gardening has become the nation's number one outdoor leisure time activity according to this 1982-83 Gardens for All/Gallup National Gardening Survey." A fact sheet on the survey is available by sending $1.00 to cover costs of postage and handling to Dept P156, 180 Flynn Avenue, Burlington VT 05401.



A SKETCH OF THE NEW HOME OF THE LAWN INSTITUTE HEADQUARTERS IN PLEASANT HILL, TENNESSEE

QUARTERLY PROGRAM REPORT

(INSTITUTE PROGRESS AND ACHIEVEMENT)

In addition to travel and participation in conferences and meetings listed under ITINERARY, program activity has involved the following four areas:

MEMBERSHIP/VARIETY REVIEW/PRODUCT REVIEW/ LOGO/SEAL OF APPROVAL RELATIONSHIPS

At the 1982 Lawn Institute Annual meeting, President Norm Rothwell initiated a process for study of the relationships between membership and the functioning of Variety Review and Product Review Boards and use of the Institute Logo and Seal of Approval. To be included in the study were issues concerning proprietary and public turfgrasses as well as the extent to which The Lawn Institute should become more active in the allied industry area. Your views sent to the headquarter's office will be of value to the Study Committee. A report will be presented at the 1983 Annual meeting.

THE LAWN INSTITUTE -
- Who We Are and What We Do -

A leaflet describing the organization and goals of The Lawn Institute and including information on membership and program support is available from the headquarter's office. It has been designed to tell more about who we are and what we do.

LAWNS, GARDENS AND POOLS

Twenty two articles on lawns (590 lines of typed copy) has been submitted to the William C Pflaum Co for use in their 1983 edition of Lawns, Gardens and Pools. This educational effort is supported jointly by the American Seed Trade Association Lawn Seed Division and The Lawn Institute. These articles along with others on gardening and pools are used annually by communicators concerned with out of doors living topics

THREE PAPERS PRESENTED ON LAWNS AND TURF

At- New York State Turfgrass Conference

-"Turfgrasses for Athletic Uses"

-"Low Maintenance Lawns- Are They the Future ?"

At- Oregon Seed Growers League

-"Lawn Seed Fit for a Global Market"

Two papers presented at the New York State Turfgrass Conference will be printed in their conference proceedings. The Oregon Seed Growers League paper is included in this issue of Harvests.

ITINERARY

(TRAVEL, MEETINGS ATTENDED)

In a continuing attempt to keep The Lawn Institute current in turfgrass science and practice, the following contacts were made during the past quarter:

November 1 - Blacksburg, VA
Virginia Polytechnic Institute and State University
Field research review with Dr R E Schmidt
Extension education review with Dr J R Hall III

November 3 - Williamsburg, VA
The Lawn Institute Executive Committee meeting

November 3,4 - Williamsburg, VA
The Atlantic Seedsmen's Association meeting

November 5 - Williamsburg, VA
American Seed Trade Association- Lawn Seed Division meeting

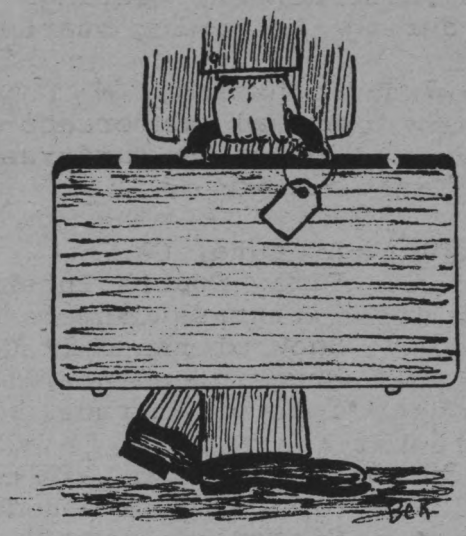
November 9,10- Rochester, NY
New York State Turf Conference

November 11 - Bound Brook, NJ
Lofts Pedigreed Seed Inc
Research review with Richard Hurley

November 15 - Beltsville, MD
USDA research review with Jack Murray

November 15 - Beltsville, MD
USDA Plant Variety Protection office program review with Dr K H Evans and J J Higgins

November 15 - College Park, MD
Dr F V Grau consultations regarding The Musser Foundation and turfgrass research



November 16 - College Park, MD
University of Maryland
Turfgrass extension review with Dr Thomas Turner

November 28-December 3 - Anaheim, CA
The American Society of Agronomy Diamond Jubilee meeting

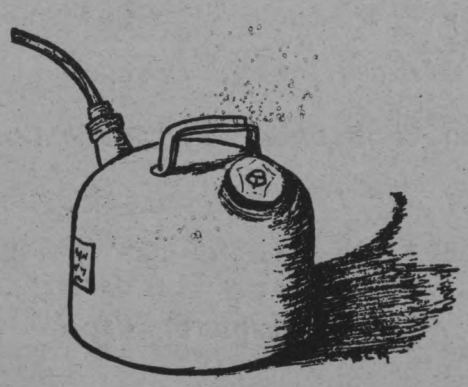
December 6,7 - Portland, OR
Oregon Seed Growers League meeting
Discussions were scheduled with:

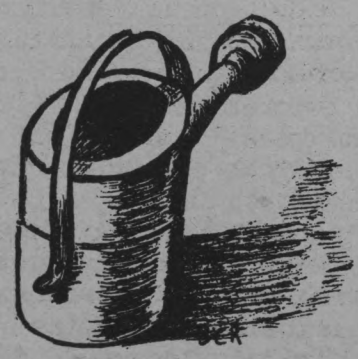
Board of Directors
Oregon Fine Fescue Commission

Board of Directors
Merion Bluegrass Association

Northwest Chewings Fescue and Red Creeping Fescue Association (Annual meeting)

Highland Bentgrass Association (representatives)





Looking Ahead

(PLANS FOR THE FUTURE)

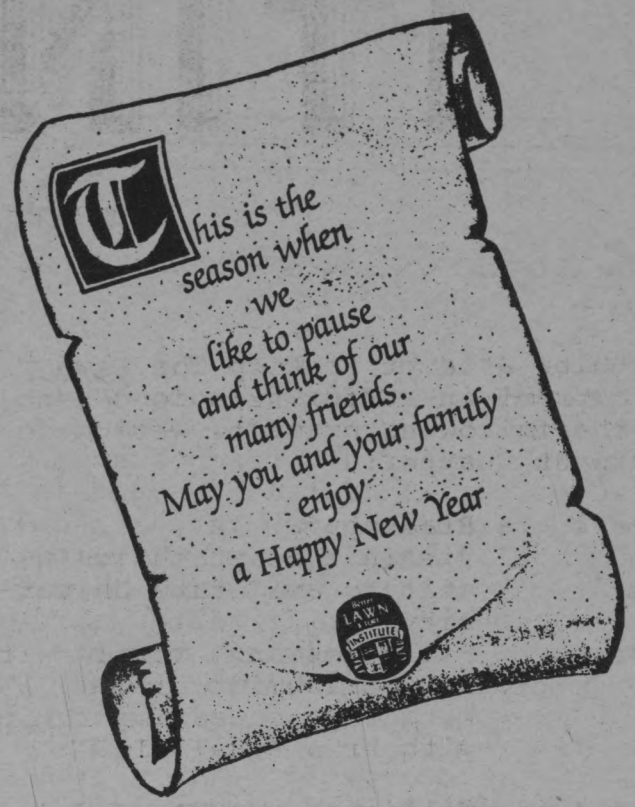
The Lawn Institute will be represented at the following conferences, meetings and trade shows during the coming quarter:

January 6,7 - Nashville, TN
Annual Conference of the Tennessee Turfgrass Association

February 20-25-Atlanta, GA
Fifty fourth International Turfgrass Conference and Show of the Golf Course Superintendents Association of America

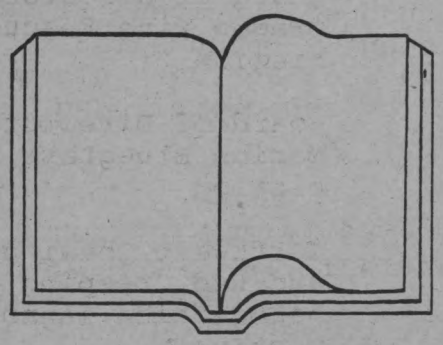
February 28-March 2 - West Lafayette, IN
Midwest Regional Turf Conference

In conjunction with these meetings in the southeast and midwest, other turfgrass related contacts will be scheduled.



THRESHING THE JOURNALS

(REVIEW OF CURRENT TURFGRASS RESEARCH LITERATURE)



The American Society of Agronomy annual meeting held the last of November and first of December 1982 featured fifty eight papers concerned with turfgrass science. These were presented orally and abstracts were included in Agronomy Abstracts -1982- Annual Meetings. Many of these papers will be published, providing more detail, in scientific journals. This series of reports represents an excellent cross section of current turfgrass research in the United States. Research results were reported from twenty eight states representing each of the several distinct climatic regions of the country. More than two papers were presented by turfgrass scientists from the states of Florida, Georgia, Illinois, Iowa, Nebraska, Pennsylvania and Texas.

Topics presented here have been grouped into eleven categories for your review:

-Turfgrass Genetics, Tissue Culture and Breeding

-Variety Evaluations

-Turfgrass Heat and Cold Hardiness

-Seeds and Seeding

-Sod and Sodding

-Soil Testing and Influence of Acidity and Fertility on Turfgrass

-Lawn Service Fertilization

-Growth Regulation and Weed Control

-Insect and Disease Control

-Soil Modification

-Water Use and Conservation

THRESHING THE JOURNALS

CONTINUED

TURFGRASS GENETICS, TISSUE CULTURE AND BREEDING

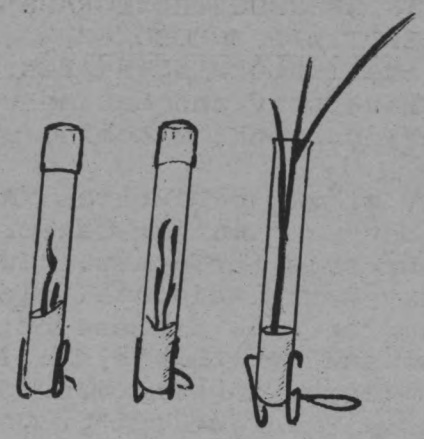
Six reports were presented. These are indicative of current research emphasis. Interest in turf type tall fescues and the genetic potential of tall fescues in general is significant. New research on rough bluegrass appears promising. Growth characteristics of this grass are unique. The use of tissue culture in plant improvement research has the potential for becoming an important asset in turfgrass science.

GENETIC VARIABILITY OF SEED YIELD IN TALL FESCUE
University of Missouri (Nguyen,Sleper)

Based on fifteen tall fescue parents that were randomly selected from a broad based population, breeding potential for the following characteristics was found to be excellent: Maturity Score, Number of Panicles, Panicle Length, Seed Yield and Seed Weight per Panicle. Heritability estimates were low for plant height, lodging score, reproductive herbage yield and number of seeds per panicle. Early-maturing plants had a larger number of panicles, shorter panicles, higher seed yields and larger seed size. These results were obtained from half-sib progenies using polycross mating. All entries were evaluated for two years at two locations.

GENOTYPIC VARIABILITY IN TALL FESCUE TO PRODUCE CREEPING ROOTED STEMS
University of Georgia (D'Uva,Bouton,Brown)

Tall fescue is widely adapted throughout the transition zone of the country with Georgia located on the southern edge of adaptability. Heat stress limits vigor and ability to regenerate vegetatively. Twenty four tall fescue genotypes which were space planted as replicated, rooted tillers were grown for eight months in two locations and evaluated for rooted stem number and length, including both rhizomes and stolons. A wide variation in the development of rhizomes and stolons was found. Rooted stem numbers varied from 0 to 51 per plant; stem length from 0 to 7 cm (0 to 3 inches); and crown area from 10 to 91 square cm (1.5 to 14 square inches). In some genotypes, rooted stems resembled rhizomes, while in others they resembled stolons. Crown area and rooted stems produced were directly related. Further study is required to determine the usefulness of this spreading characteristic in development of tall fescues for better adaptation in marginal areas.



CALLUS INDUCTION AND PLANT REGENERATION IN KENTUCKY BLUEGRASS
University of Nebraska
(Manton, Riordan, Shearman)

Tissue culture involves the development of plants from callus tissue utilizing growth regulators under highly controlled conditions. Orchardgrass, big bluestem, annual ryegrass, tall fescue and creeping bentgrass have been successfully cultured in this way. Because apomixis complicates genetic improvement of Kentucky bluegrass, tissue culture from immature inflorescences was attempted using the cultivar Adelphi. Whole plants were regenerated by 49 percent of the callus tissue, while 38 percent developed roots only. The appearance of albino plants provided evidence of genetic instability. Sixty six percent of the whole plants transplanted to soil in the greenhouse survived. These results were sufficiently encouraging to indicate the potential for Kentucky bluegrass improvement by use of cell and tissue culture.

HERITABILITY ESTIMATES FOR ROUGH BLUEGRASS BASED ON VARIABILITY OF REPLICATED CLONAL MATERIAL
Rutgers University (Hurley,Funk)

Rough bluegrass has excellent shade tolerance under cool moist soil and climatic conditions. It is intolerant of heat and drought. Potential for use in overseeding is promising and the cultivar Sabre has lead to increased interest in this grass. The variability existing in natural populations of rough bluegrass was examined in 234 clones collected from old turf stands. Evaluations for turf quality, leaf color, leaf texture, growth habit, plant density, seed shattering and disease susceptibility indicated genetic variability for all characteristics. Improvements in sod density, darker green foliage, more desirable leaf texture and disease resistance are believed reasonable research objectives. Nine of the clones exhibited improved non-shattering tendencies.

THRESHING THE JOURNALS

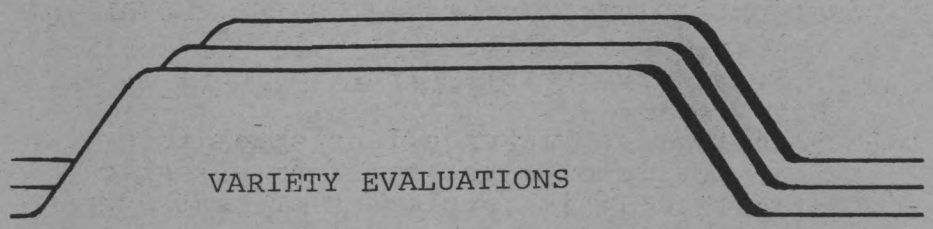
CONTINUED

SUSCEPTIBILITY OF ROUGH BLUEGRASS GENOTYPES TO SCLEROTINIA HOMOEOCARPA AS AFFECTED BY NITROGEN NUTRITION
Rutgers University and USDA-ARS-NER
(Hurley, Funk, O'Neill)

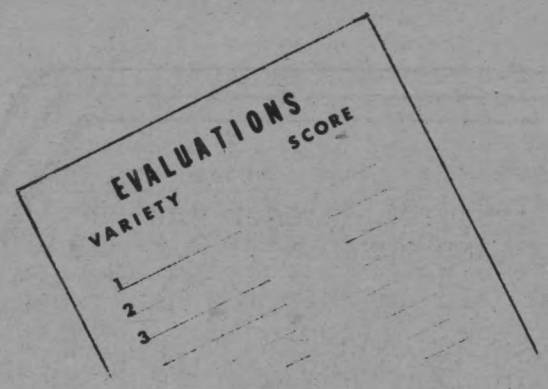
Susceptibility of rough bluegrass to dollar spot has been a limiting factor in the expanded use of this turfgrass. Two hundred and thirty four individual clones were evaluated for this disease both in the greenhouse and in the field. Inoculations of S. homoeocarpa were made to induce the disease. Variations in degree of susceptibility were noted. In addition, there was characteristically less disease where additional nitrogen was applied. No selections were found to be totally resistant to dollar spot.

HERITABILITY ESTIMATES FOR TURFGRASS TRAITS IN BERMUDAGRASS
New Mexico State University
(Woffard, Baltensperger)

Improved bermudagrasses are propagated vegetatively. In order to study the potential for development of new seeded types, eight parental clones and their polycross progeny were vegetatively established in a replicated field experiment. Visual scores were made on general appearance, vigor, color and density. Stolon internode length, leaf length and leaf width measurements were made. Differences in vigor, stolon internode length, leaf length and color indicated favorable breeding potential.



Five reports were primarily concerned with variety evaluations in specific regions of the country. Such characteristics as salt tolerance, seasonal root response and shoot strength were studied. Evaluations of Kentucky bluegrasses, perennial ryegrasses, buffalograss and adalaydgrass received major emphasis.



PERFORMANCE OF KENTUCKY BLUEGRASS AND PERENNIAL RYEGRASS CULTIVARS IN COASTAL NORTH CENTRAL CALIFORNIA
University of California
(Harivandi, Gibeault)

Forty three Kentucky bluegrasses and twenty nine perennial ryegrasses were evaluated for adaptation and turf quality. Plots established in the fall of 1978 were clipped at a 5 cm.(2 inch) height. Clippings were returned and level of fertility and irrigation maintained at a low rate. No pesticides were used, nor was turf dethatched during the three year evaluation period. Turf was scored by a visual quality rating on a monthly basis. Several cultivars of each species produced "acceptable" turf under these low maintenance conditions. More variation was found with Kentucky bluegrasses than with perennial ryegrasses. Disease caused low ratings in bluegrasses and cutting quality and color lowered scores of ryegrasses. Among the best bluegrasses were: Merit, Columbia, Rugby, Hoga, Entropper, Trenton, A-34, Cheri, Sydsport, Ram I, Aquila, Baron, Parade, Majestic, Enmundi, Victa, Brunswick, Geronimo, Enaldo, Adelphi and Berka. Of the perennial ryegrasses, Blazer, Yorktown II, Pennfine, Diplomat, Arno, Elka, Derby and Fiesta scored highest.

THE USE OF BUFFALOGRASS AS A TURFGRASS IN THE TALLGRASS PRAIRIE REGION
Iowa State University (Brahm, Christians)

Buffalograss is a warm-season native of the great plains short-grass prairie. It is drought tolerant and used for low maintenance turf. As interest has increased in natural landscapes and energy efficient lawns, the prospects of introducing buffalograss as a turfgrass in the tall-grass prairie region have been considered. Buffalograss is subject to encroachment of cool season grasses. It enters dormancy with the first frost in the fall and is slow to green up in the spring. Simazine at about 0.7 oz per 1000 square feet (2.2 Kg/ha) gave most effective control of unwanted bluegrasses. Buffalograss cultivars, Common, Texoka and Sharp's Improved produced best turf at a 2 inch height of cut (5.0 cm). Applications of nitrogen had little effect on color or quality of the turf.

SALT TOLERANCE OF ADALAYDGRASS
University of California (Leonard,Youngner)

Adalaydgrass (Paspalum vaginatum Swartz, var, 'Adalyad') is a new turfgrass that has high salt tolerance. Plants grown in solution culture with increasing amounts of sodium and calcium chloride had excellent salt tolerance. Clipping dry weights decreased only 35 percent at the highest salt level. Increasing sodium was not found to be antagonistic to potassium uptake, but may inhibit some magnesium absorption. Both sodium and chlorine increased in all plant parts as salts increased. Increased plant succulence and salt glands, possible mechanisms for regulation of internal ion concentrations,were not evident. Adalaydgrass shows great promise for use on salt-affected soils or with low quality irrigation water.

SEASONAL ROOT RESPONSES OF FIVE COOL SEASON TURFGRASSES
Ohio State University (Koski,Karnok)

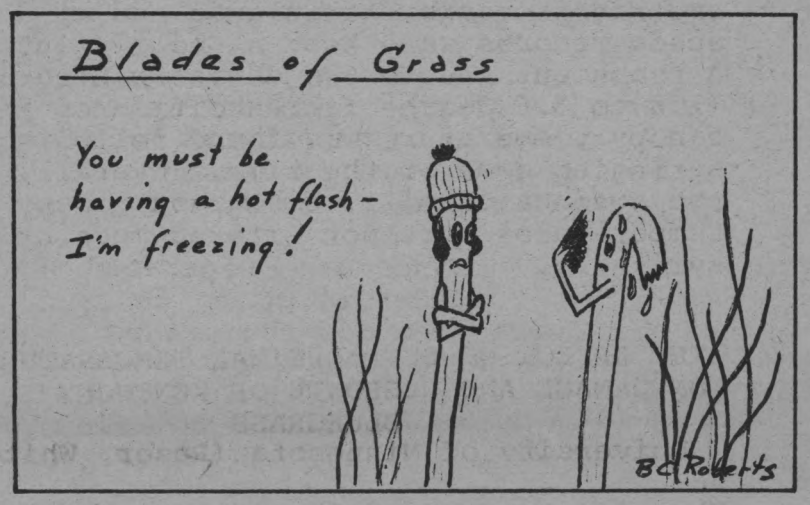
Seasonal rooting characteristics of creeping bentgrass (Penncross), tall fescue (Rebel), perennial ryegrass (Manhattan), Kentucky bluegrass (Baron), and annual bluegrass were evaluated in a turfgrass rhizotron. Cutting height of creeping bentgrass and annual bluegrass was one inch (2.5 cm). The other species were maintained at a two inch height (5.0 cm). Approximately five pounds of nitrogen per 1000square feet (2.4 Kg/are) per year was used as a maintenance treatment. Observations over a two year period indicated differences in rooting depth, growth activity and senescence patterns. Maximum activity occurred from mid-March to the end of April for Penncross, Baron, Rebel and Manhattan. Annual bluegrass had a severe reduction in root activity the beginning of April. This coincided with seedhead formation by that species. Manhattan had the deepest roots. Rebel roots were deeper than Baron or Penncross. Annual bluegrass had the shallowest and least extensive root system.

METHOD FOR DETERMINING SHOOT STRENGTH IN KENTUCKY BLUEGRASS CULTIVARS
University of Nebraska
(Bruneau, Hanna, Shearman, Bishop)

Shoot strength was determined by measuring the puncture and shear forces needed on different Kentucky bluegrass cultivars. Park exhibited the greatest shear strength and Sydsport the least, regardless of whether they were grown in the field or under controlled environmental conditions. Park had the highest shoot puncture strength of all field grown palnts, Other bluegrasses, including Adelphi, Baron, Fylking and Touchdown, had lesser shoot strength. These measurements could not be correlated with wear resistance but may be related to insect injury.

TURFGRASS HEAT AND COLD HARDINESS

Five research projects considered various aspects of heat and cold on hardiness of different turfgrasses. Ability of turf to withstand environmental stress is especially important in the transition zone between warm season grass adaptation and cool season grass adaptation. It is also a recognized limiting factor in northern regions of extreme cold.



THE EFFECTS OF NITROGEN LEVEL AND SAMPLING DATE ON THE HEAT TOLERANCE OF KENTUCKY BLUEGRASS AND PERENNIAL RYEGRASS
University of Maryland
(Minner, Wehner, Dernoeden)

Sydsport, Pennstar and Vantage Kentucky bluegrasses and Pennfine, Citation and Caravelle perennial ryegrasses were evaluated for heat tolerance at six dates during July and August. Plants were field grown using four different nitrogen treatments (0,2,3 and 4 pounds per 1000 square feet per year) 0,98,147 and 196 Kg/ha/yr. Heat treatments of 42,44 and 46 degrees centegrade (108,111 and 115 degrees fahrenheit) were imposed on plants sealed in plastic bags and placed in the appropriate water bath for thirty minutes. Recovery was evaluated in the greenhouse. Differences were found between cultivars but not between nitrogen treatments. Bluegrasses were generally more heat tolerant than ryegrasses. Sydsport exhibited better heat tolerance than the other bluegrasses and Pennfine had most heat tolerance of the ryegrasses. Differences were noted between sampling dates. Heat tolerance at each date was correlated with the amount of precipitation and the average high temperature for the period just prior to sampling. July tolerances were better than August.

THE JOURNALS

THE INFLUENCE OF SYRINGING ON THE CANOPY TEMPERATURES OF BENTRASS GREENS

North Carolina State University (DiPaola)

Syringing provides small amounts of water on turfgrass foliage with the objective of cooling leaf surfaces during warm, often humid conditions. This practice was studied on a Penncross creeping bentgrass golf green maintained at one quarter inch (0.64 cm). Eight rates of water application at one of two times (11 AM and 1 PM) were established as treatments. Canopy and air temperatures, relative humidity, barometric pressure, irradiance and wind speed records were kept at hourly intervals. A transient one to two degree centegrade (1.8 to 3.6 degree fahrenheit) drop in canopy temperature was found following syringing some of the time. Overall, in the absence of wilt, bentgrass canopy temperatures were not altered much by syringing.

THE EFFECT OF SUPRAOPTIMAL TEMPERATURES ON DAMAGE AND REGROWTH OF KENTUCKY BLUEGRASS

University of Minnesota (Ruser, White)

The effect of controlled supraoptimal temperatures on damage and regrowth of Fylking, Glade, Baron and Adelphi Kentucky bluegrass sod was investigated. Temperatures varying from 30.0 to 45 degrees centegrade (80 to 133 degrees fahrenheit) were imposed by use of a water bath. Treatment duration varied from one to forty eight hours. Thirty seven and five tenths degrees centegrade (99.5 degrees fahrenheit) was the threshold temperature for the regrowth of roots. After one hour of this treatment, regrowth of roots was severly limited. Longer exposure at this or higher temperatures were required for adverse effect on topgrowth. Visible cellular damage was observed in leaf tissue following treatment at forty degrees centegrade (104 degrees fahrenheit). These results have been related to post harvest heating and damage during storage and handling of sod. Up to temperatures of forty degress centegrade, respiration of living tissue is involved; after forty degrees centegrade, heat is generated by thermophillic micro-organisms decomposing dead tissue. The rate of heating up to forty degrees is uniform. Optimum temperature for foliage is about 26.7 degrees centegrade (80 degrees fahrenheit). That for roots is about 15.6 degrees centegrade (60 degrees fahrenheit). Verdure has a great influence on heat generation. More information is needed on rhizome and crown tolerance to variations in temperatures.

THE EFFECTS OF FALL DROUGHT STRESS, FALL APPLIED NITROGEN AND LATE WINTER ICE COVER ON THE COLD HARDINESS OF PERENNIAL RYEGRASS TURF

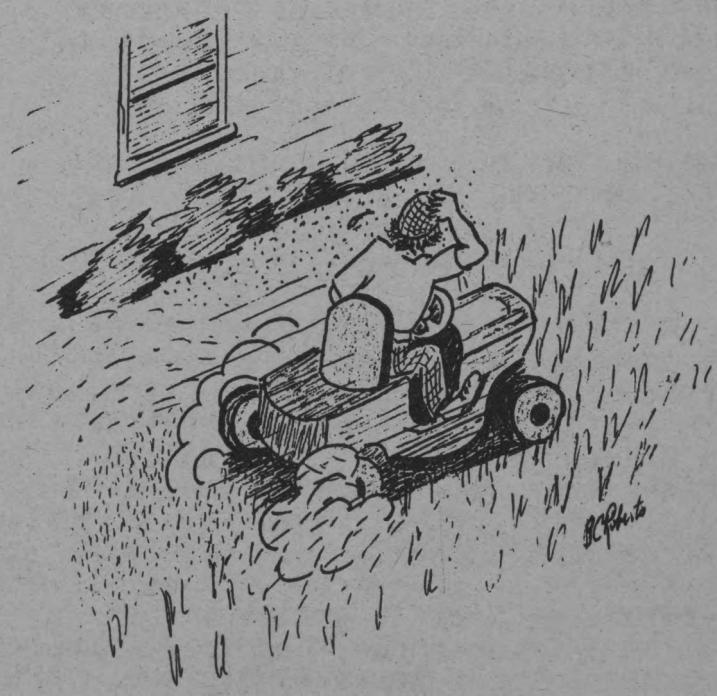
The Pennsylvania State University (Welterlen, Watschke)

Crown samples of Pennfine perennial ryegrass were used to evaluate cold hardiness. Results indicated that September applied nitrogen decreased hardiness while drought stress did not. Ice cover resulted in an amplification of the cold hardiness response to fall applied nitrogen. Crowns from plants under ice which had been treated with 3 pounds of nitrogen per 1000 square feet in September (146.7 Kg N/ha) were injured more than those not receiving nitrogen. Increasing cold hardiness of perennial ryegrass turf through adoption of proper cultural practices is important in extending northern limits for use of this grass.

USING PROTECTIVE COVERS ON BENTGRASS PUTTING GREENS

University of New Hampshire (Roberts)

Emerald creeping bentgrass was used to study desiccation during winter and early spring. Late fall applications included composted sewage sludge, pine needles and spunbonded nylon-polyester blankets. The spunbonded materials were more effective in reducing desiccation, stimulating growth and producing an earlier spring green up. The spunbonded materials had up to five percent more soil moisture and up to eight degrees centigrade (14 degrees fahrenheit) higher soil temperatures underneath when compared to untreated turf. Under pine needles or composted sewage sludge, soils were acutally a little cooler. No snow mold developed under any of the treatments.



THRESHING THE JOURNALS

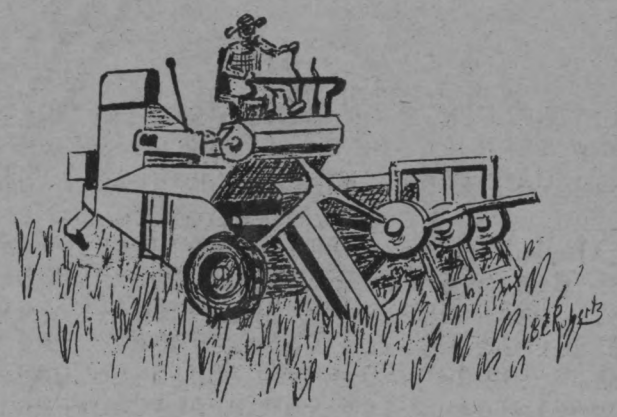
CONTINUED

SEEDS AND SEEDING

Three presentations reported results of investigations on seeds and seeding. Seed Yields in the production regions of the country are of critical importance. Maintenance of continuing high yields is a key research topic. Increasing rate of seed germination helps in stand establishment. Research to improve seed usage is always of great value.

PREGERMINATION OF ANNUAL RYEGRASS AND KENTUCKY 31 TALL FESCUE
University of Florida (Dudeck, Peacock)

Annual ryegrass and Kentucky 31 fescue seed were soaked in water or gibberellic acid for up to 48 hours and germinated in incubators at optimum or suboptimum temperatures. Annual ryegrass treated with 50 parts per million gibberellic acid and kept moist for 48 hours at 25 degrees centegrade (77 degrees fahrenheit) will germinate at a 50 percent rate in one half to one day depending on temperature. Soaking seed at the same temperature in well-aerated water for 24 hours without gibberellic acid treatment will take 3 to 6 days for half of the seed to germinate. Again, this depends on germination temperature. With Kentucky 31 fescue, the gibberellic acid treatment produced 50 percent germination in 1.8 to 3.4 days. Without gibberellic acid, 4.0 to 8.7 days were required. These treatments were found to be the most practical for promoting rapid emergence of these grass species.

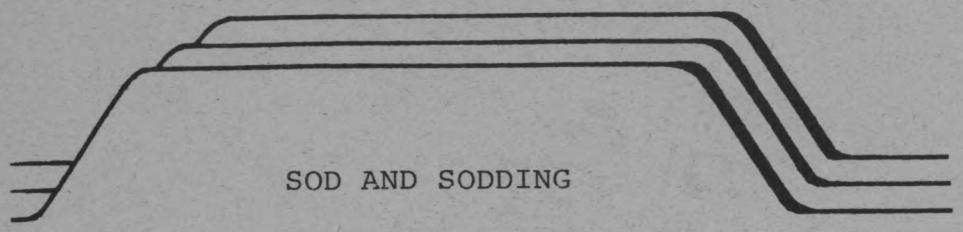


KENTUCKY BLUEGRASS SEED YIELD COMPONENTS AS AFFECTED BY RESIDUE MANAGEMENT
Texas A and M University and University of Idaho (Hickey, Ensign)

A four year field study compared the effects of burning and mechanical vacuum removal of post harvest residue on seed yield of five Kentucky bluegrass cultivars. Rhizome weights were reduced where residue was burned. Burning increased tiller numbers, panicle numbers and seed yields. Root weights were unaffected by method of residue removal. Tiller production was associated with decreased rhizome weights. The increase in tiller production where residue was burned was attributed to decreased apical dominance, allowing upturning of rhizomes into new tillers.

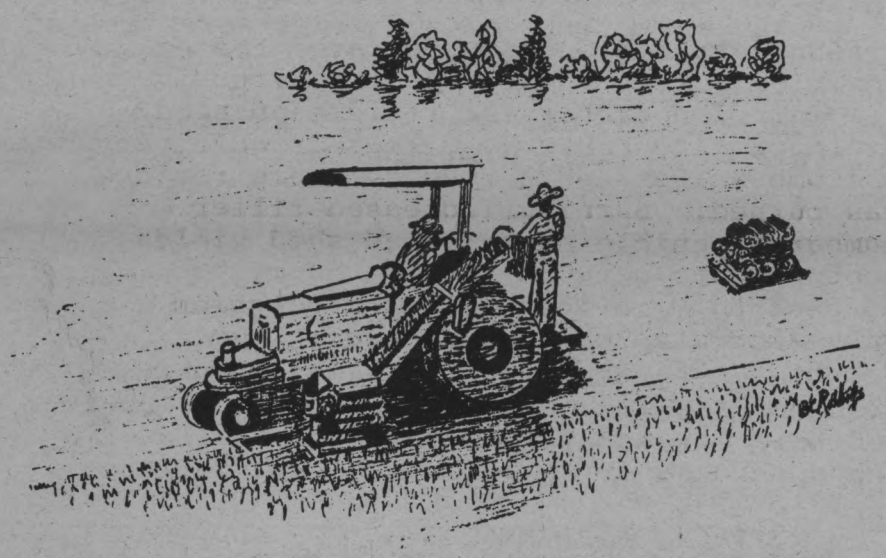
EFFECTS OF SUNLIGHT REDUCTION TO SIMULATE POST-HARVEST RESIDUE ACCUMULATIONS ON SEED PRODUCTIVITY
University of Idaho (Ensign, Hickey, Bernardo)

Kentucky bluegrass grown for seed in the Pacific northwest produces an abundance of straw residue which must be removed after harvest. Baron Kentucky bluegrass was used to measure the effect of artificially reduced sunlight on tiller growth, plant development and seed yield. After field burning in Septmenber, shade screens, which excluded 30 and 67 percent of the sunlight were suspended about twenty inches (50 cm) over the soil surface and left in place for 75 and 130 days. Artificially shaded plants produced fewer tillers, shroter stems and leaf sheaths and fewer panicles than plants which had no residue removed. Plants which were open field burned and not shaded produced more tillers, shorter stems and sheath lengths, more panicles and greater seed yield than plants which had no residue removed or were artificially shaded.



SOD AND SODDING

Three research project concerned with sod and sodding were reviewed. Growth of sod on mineral and on organic soil continues to create differences in handling and transplanting. Research is helping to explain these differences. Use of sewage sludge in sod production has been found to have both potential and limitations. Decreasing time to produce sod for market by use of nets and other practices helps increase production efficiency. A fourth report is included in the section on heat and cold hardiness. It is concerned with post harvest heating of sod.



A COMPARISON OF ORGANIC VERSUS MINERAL GROWN SOD FOR TURF ESTABLISHMENT
University of Florida (Peacock,Dudeck)

A comparison of organic (muck) versus mineral (sand) grown sods for turf establishment was made utilizing Floratam St Augustinegrass. Sand grown sod had greater rooting strength than muck sod. A rate of nitrogen fertilization of one pound per 1000 square feet (5g N/m^2) at the time of sodding produced greater rooting strength than twice that amount. Turf quality and growth rate were best for the muck sod. Two pounds of nitrogen per 1000 square feet (10g N/m^2) produced the best quality turf and the fastest growth rate. Organic sod consists of about 74 percent organic matter and 2.9 percent nitrogen. Mineral sod has about 4 percent organic matter and 0.18 percent nitrogen. As organic muck oxidizes, turf crowns become more exposed. This may help explain the decline in turf quality on lawns established from muck grown sod during the second and third growing seasons.

USE OF COMPOSTED SEWAGE SLUDGE IN KENTUCKY BLUEGRASS SOD PRODUCTION
Michigan State University
(Carroll, Rieke, Jacobs)

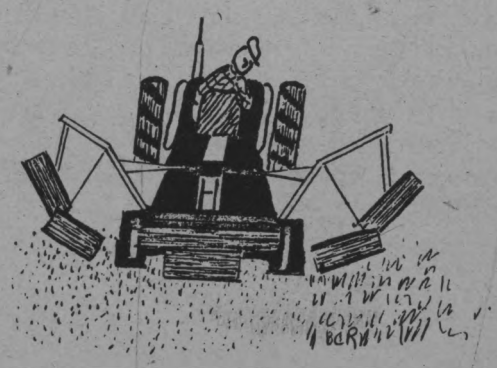
Detroit dewatered sewage sludge cake, composted by the Beltsville aerated pile method was incorporated to depths of 4 or 8 inches (10 or 20 cm) on a fine sand and on a sandy clay loam prior to establishment of Kentucky bluegrass for sod. Two years after treatment, increasing rate of compost increased saturated hydraulic conductivity, soil water holding capacity and plant available water. Soil bulk density decreased. Levels of phosphorus, potassium, calcium, zinc, copper, cadmium and nickel in the soil and in clippings increased. Heavy metal contents of clippings were not increased sufficiently of affect turf growth or sod development. Compost additions increased soil pH. The following actual and acceptable levels of heavy metals (parts per million) in the sludge were recorded:

	Actual ppm	Acceptable ppm
cadmium	60	25
chromium	1180	1000
copper	540	1000
lead	570	1000
nickel	480	200
zinc	1680	2500

No nitrogen response was noted on the sand: however, there was a nitrogen response on the cly loam. No difference was found in sod strength that could be related to use of compost.

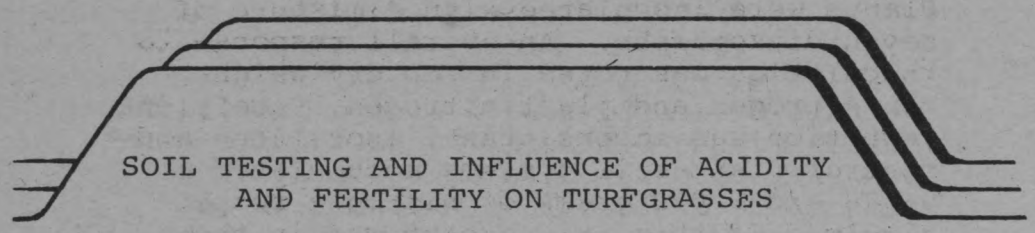
RAPID PRODUCTION OF CENTIPEDE SOD USING PLASTIC NET
University of Georgia (Burns)

Centipedegrass produces a low maintenance turf, resulting in energy conservation, because of its slow growth and low fertility requirements. Plastic nets were studied as a means of reducing time required to produce sod. Nets were placed on the soil following seeding at various rates. After 78 days, sod cut at about one half inch (12 cm) thickness was too weak to hold together. Where nets were used, sod strength was increased and sod had good dimensional stability. The interaction of the plant and the small mesh (5mm) net was more efficient than for the larger net (18mm mesh). Rate of ground cover was directly related to rate of seeding.



THREADING THE JOURNALS

CONTINUED



SOIL TESTING AND INFLUENCE OF ACIDITY AND FERTILITY ON TURFGRASSES

Nine papers were concerned with some aspect of soil testing or influence of soil acidity and fertility on turfgrasses. Applications of lime and fertilizer provide the means for initiating the greatest control possible over turfgrass growth and development. These reports help in improving our understanding of soil-turfgrass relationships.

SOIL TEST CALIBRATION STUDIES FOR TURFGRASS ESTABLISHMENT

University of Maryland and
The Pennsylvania State University
(Turner,Waddinton)

Seedings of perennial ryegrass-Kentucky bluegrass, and red fescue-Kentucky bluegrass mixtures as well as monocultures of perennial ryegrass, red fescue and Kentucky bluegrass were used to evaluate turfgrass response during establishment. Different levels of applied phosphorus, postassium and limestone on soils of different initial levels of fertility were seedbed treatment variables. Initial soil fertility varied as follows:

Value	Low	to	High
pH	5.6		6.5
phosphorus (ppm)	6.0		76.0
potassium (me/100g)	0.08		0.20
calcium (me/100g)	4.1		6.1
potassium saturation	0.8 %		2.2 %
calcium saturation	41.7 %		64.5 %

On these soils, limestone and potassium applications had no beneficial effects during the first year of establishment. Where there was less than 30 ppm phosphorus most rapid and satisfactory establishment occurred when soil phosphorus was increased to 40 to 70 ppm. This was accomplished by adding 1.3 to 4.0 Kg/a to the seedbed (2.7 to 8.2 pounds per 1000 square feet). More phosphorus than this gave little additional benefit. Phosphorus raked into the surface half inch produced about the same response as higher rates worked in to a depth of about 4 inches.

SULFUR-COATED UREA VERSUS AMMONIUM NITRATE ON THE PRODUCTION OF FOUR WARM SEASON GRASSES

Brigham Young University
(Mooso, Jolley, Robison,Nelson)

Four warm-season grasses, Pensacola bahiagrass, Bigalta limpograss, Pangola digitgrass and Callie bermudagrass were treated with six levels of ammonium nitrate and sulfur-coated urea at a field location in Central Florida. Phophorus and potassium were applied in conjunction with the nitrogen sources in a 9:1:4 nitrogen: phosphorus: potassium ratio. Treatment level affected the total annual dry matter production for each of the grasses. Pangola digitgrass and Pensacola bahiagrass treated with sulfur-coated urea produced less dry matter than when treated with ammonium nitrate. No differences were observed with the other two grasses.

EFFECT OF ELEMENTAL SULFUR AND ACIDITY ON THE GERMINATION AND GROWTH OF ANNUAL BLUEGRASS AND PERENNIAL RYEGRASS

University of Florida (Varco, Sartain)

Effects of elemental sulfur and soil acidity on germination, establishment and yield of annual bluegrass and perennial ryegrass were evaluated under greenhouse and growth chamber conditions. Applications of elemental sulfur at rates of 50 to 150 Kg/ha (1 to 3 pounds per 1000 square feet) were incorporated in the top one sixth of pots filled with a fine sandy soil. A soil pH of 4.8 was found when 100 Kg/ha (2 pounds per 1000 square feet) of sulfur was used. This reduced emergence of annual bluegrass at the 17th day and establishment and yield at the 30th day. Emergence was reduced 40 %, establishment 47 % and yield 63 %. When Pennant ryegrass was used as the test plant, emergence was reduced 18 %, establishment 15 % and yield 20 %. With decreasing pH from 7.0 to 4.3 germination of Pennant ryegrass was reduced 3.5 %; germination of annual bluegrass decreased 41 %.

THREADING THE JOURNALS

CONTINUED

EFFECT OF ACIDITY ON NUTRIENT UPTAKE AND GROWTH OF WARM AND COOL SEASON TURFGRASSES

University of Florida (Sartain)

A range of soil pH (3.9 to 6.8) was established using elemental sulfur or calcium hydroxide. A study was initiated on the influence of soil acidity on nutrient uptake, efficiency of applied nitrogen from different sources, growth, thatch development and weed infestation in Tifgreen bermudagrass and Derby ryegrass. Three sources of nitrogen- ammonium sulfate, IBDU and sewage sludge were used. Tifgreen bermudagrass grew well across the entire pH range. Excessive thatch developed on plots having a pH below 5.0. Derby ryegrass establishment was reduced at a pH below 4.7. Annual bluegrass did not establish in plots with a pH below 4.6. Overall weed infestation was reduced below pH 5.0. Soil reaction influenced the growth response from IBDU more than the other nitrogen sources.

AN ASSESSMENT OF OXAMIDE AS A NEW NITROGEN SOURCE FOR TURFGRASS

Texas A and M University (Beard,Johns,Menn)

Oxamide has been found to be a promising nitrogen carrier for turfgrass fertilization. Texas common St Augustinegrass and Tifway bermudagrass were used as test grasses under the hot, humid climate and alkaline soil conditions of the southwestern United States. Oxamide was compared with standard nitrogen carriers in spring, summer and fall experiments. Oxamide performed in these trials as one of the better nitrogen carriers. It had good slow release properties. It also has the capacity to produce a distinctly darker green color than the other nitrogen carriers without excessive shoot growth. This response was particularly noticeable in terms of extended late fall color and early spring green up.

DINITROGEN FIXATION WITH 'PARK' KENTUCKY BLUEGRASS LINES

University of Nebraska (Lee,Shearman,Klucas)

Park Kentucky bluegrass turf inoculated with Klebsiella pneumoniae (W-6) possessed nitrogenase activity in two previous Nebraska studies. Nitrogen fixation activity under field conditions within fifteen lines comprising Park was investigated with emphasis on determining potential for specific activity. Acetylene (C_2H_2) reduction was detected in the intact cores but differences were not evident among the lines nor between inoculants. However, nitrogenase activities were different in washed roots with the two inoculants. The potential for increasing nitrogen fixation capacity under mowed turf is considered sufficient for further investigation.

EVALUATION OF N_2-FIXATION IN BAHIAGRASS BY ^{15}N-ISOTOPE DILUTION AND OTHER TECHNIQUES

University of Florida (Green,Smith,Littell,Schank)

The potential for nitrogen fixation in twenty one genotypes of bahiagrass was investigated under greenhouse conditions. Plants were inoculated with a mixture of seven diazotrophs. An overall response to inoculation was noted in top dry weight, top nitrogen and plant nitrogen. Acetylene reduction was inconsistant. Inoculated and control plant-soil systems accumulated 0.096 and 0.092 grams of nitrogen respectively. Of this, 81 percent was in the soil and 76 percent of this portion was organic. Recovery of ^{15}N-Isotope for the system and for the plant were 57 percent and 40 percent respectively. Thirty one percent of our nitrogen is fixed by industrial processes. This takes petroleum energy. Boilogical nitrogen fixation amounts to 15 to 30 Kg/ha per year (0.3 to 0.6 pounds per 1000 square feet).

NITRATE LEACHING, REDOX POTENTIAL DENITRIFYING MICROORGANISMS AND TURF QUALITY AS AFFECTED BY SUBSOIL AMENDMENT AND DRAINAGE STATUS

University of Nevada (Young,Helms)

To test the possibility of removing nitrate by denitrification below the root zone, the effect of wheat straw, peat, wood plus bark and sulfur as subsoil amendments in conjunction with restricted drainage were measured. Nitrate, nitrite and total nitrogen were leached from lysimeters sodded with Kentucky bluegrass fertilized with ammonium nitrate at one pound of nitrogen per 1000 square feet (48.7 Kg/ha) per month. The restricted drainage lysimeters leached much less nitrate and total nitrogen than the controls. No differences among amendments were noted. The final population of denitrifying microorganisms did not differ with treatment. Turf yield and nitrogen removed by the turf were lowered by the restricted drainage treatments, but the turf appeared healthy.

INFLUENCE OF FERTILIZERS ON A MICRONUTRIENT TREATED SAND-BASED PUTTING GREEN

University of Illinois, USGA Green Section, Oklahoma State University (Fermanian,Battan,Claypool,Huffine,Samples)

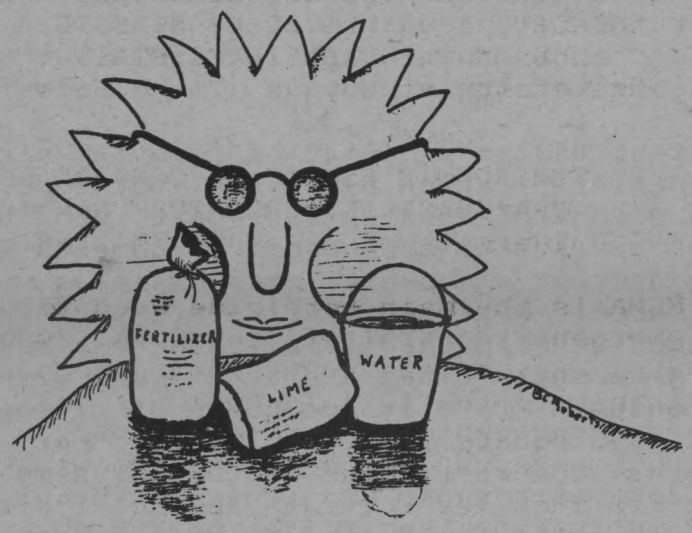
Penncross creeping bentgrass maintained as putting green turf was evaluated for response to applications of sulfur, a micronutrient fertilizer (Perk) and routine treatments of three nitrogen fertilizers. Urea with either a 0.5 or 1.0 percent terrazole coating, non-coated urea, Milorganite and Ureaform were compared. Regardless of nitrogen source, sulfur applied at from 1,463.6 to 2,927.2 Kg/ha (28 to 56 pounds per 1000 square feet) increased yields. Turf fertilized with urea and 487.9 Kg/ha (10 pounds per 1000 square feet) of Perk had higher yields than other Perk treated plots.

THREADING THE JOURNALS

CONTINUED

LAWN SERVICE FERTILIZATION

Six research projects were concerned with lawn treatments and applications of the type utilized in lawn service. These emphasized the safe and effective use of liquid fertilizers. Since the mid 1950's when oil dealers first became interested in use of their trucks in the "off season" by making applications of liquid fertilizers to lawns, the lawn service professional has developed a highly creditable image. Research has been a key element in this process.



LIQUID NITROGEN FERTILIZATION PROGRAMS ON KENTUCKY BLUEGRASS

Kansas State University (Carrow)

Park and Baron Kentucky bluegrasses grown on a silt loam soil and treated with urea (45-0-0) applied at the rate of 1.94 Kg nitrogen/100m^2/year (4 pounds per 1000 square feet) were evaluated for turf quality. Four treatments a year were made according to the following schedules:

Traditional-March 15,June 1,July 15,September 1
NonDormant-April 20,June 15,September 1, October 30
Winter Dormant-April 20,June 1,September 1, December 30

Nondormant late fall programs produced highest visual quality Baron. With Park, the nondormant late fall and dormant winter programs produced similar results. For both cultivars the traditional early spring programs were least effective. Mid summer to late summer quality was unacceptable in all programs because of inadequate nitrogen availability.

EVALUATION OF SIX LIQUID-APPLIED FERTILIZERS ON KENTUCKY BLUEGRASS

University of Illinois
(Spangenberg,Fermanian,Wehner)

A mixture of Columbia and Touchdown Kentucky bluegrass was used to evaluate the effect of six liquid-applied nitrogen fertilizers. FLUF, Folian, Formolene, Nitroform, UAN and urea were applied four times per season at a rate of 48.8 Kg/ha (one pound per 1000 square feet) nitrogen at each application. Chelated iron and urea were combined with slower acting sources to test rate of color response. A more favorable color response was noted when either iron or urea were added to these materials early in the season. Later applications did not produce this color boost. When used alone, Folian and Formolene gave a more rapid color change. Nitroform response was improved the second year of the study. Less thatch developed under Nitroform treatments.

FOLIAR BURN COMPARISONS OF A NUMBER OF LIQUID FERTILIZERS APPLIED TO KENTUCKY BLUEGRASS

Iowa State University (Johnson,Christians)

Several liquid fertilizers were evaluated on Kentucky bluegrass using a low volume spinning disc applicator. Each material was applied at rates of 0.13, 0.25, and 0.50 Kg/are (0.25, 0.50, 1.00 pounds per 1000 square feet) nitrogen. Treatments were not watered in. At the highest rates unacceptable levels of burn were observed on plots treated with urea and Folian. Marginal to acceptable burn levels were found on turf treated with Formalene and Formalene plus urea. Little or no burn occurred when FLUF-PLUS, FLUF or TUFF were used.

PHYTOTOXICITY OF SPRAYABLE SLOW RELEASE NITROGEN

Purdue University (Freeborg,Daniel)

Kentucky bluegrass was tested for phytotoxicity of sprayable nitrogen during 1980 and 1981 seasons. In 1980, applications were made on June 18 and July 31. In 1981, applications were made on June 5,June 30,July 29, and September 10. Liquid formulations of fertilizer containing either urea formaldehyde, urea plus urea formaldehyde combinations or urea dicyandiamide nitrification inhibitor and urea were evaluated. Ten fertilizers were included in 1980 tests and eight formulations in 1981. Climatological considerations were evaluated. No evidence of phytotoxicity was noted where materials were used properly.

THRESHING THE JOURNALS

CONTINUED

AMMONIA VOLATILIZATION LOSSES FROM FOLIAR APPLIED UREA ON FIELD GROWN 'PARK' KENTUCKY BLUEGRASS

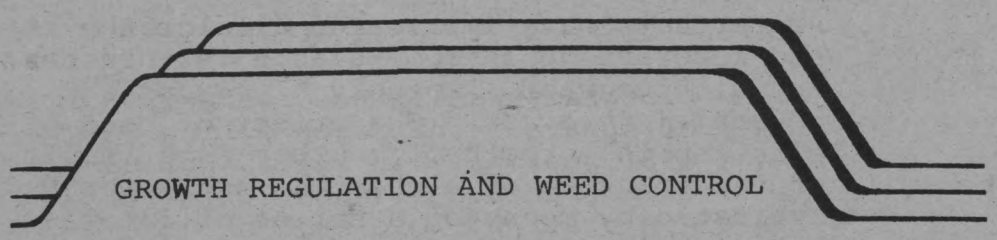
University of Nebraska
(Wesely,Shearman,Kinbacher)

Ammonia volatilization and plant uptake are important in determining nitrogen efficiency. Labeled urea (^{15}N) was applied to Park Kentucky bluegrass grown on a silty clay loam soil. This labeled urea was sprayed at rates of 1.7 and 3.4 grams of nitrogen per m^2 (One third and two thirds pounds of nitrogen per 1000 square feet). The rate of spray application was 35 ml/m^2 (0.9 gallons per 1000 square feet). Measurements of ammonia volatilization were made 1,5,9,13 and 25 hours after treatment. Additional daily measurements were made through four days (96 hours). Ammonia losses increased with nitrogen rate and time during the first day. Maximum loss occurred the second day for both treatments. Calculated four day nitrogen losses were in the range 31 to 35 percent. Nitrogen content of clippings increased with rate of applied nitrogen. Maximum uptake occurred at nine hours for both treatments. Fourteen percent of the nitrogen was absorbed from the foliar applied urea.

IRON FERTILIZATION OF KENTUCKY BLUEGRASS

University of Illinois (Yust,Wehner)

Iron sulfate or iron chelate in combination with urea was spray applied on seven dates over two years. A Columbia/Touchdown Kentucky bluegrass stand was evaluated for color. Color enhancement lasted from a few days when treatments were applied in the spring to sixty six days when treatments were made in the fall. A combination of 2.24 Kg/ha (0.75 ounce per 1000 square feet of iron from the chelate) and urea nitrogen at 25 Kg/ha (0.5 pound per 1000 square feet) were most efficacious. Neither iron source was phytotoxic unless applied at a rate higher than 17.92 Kg/ha (6 ounces per 1000 square feet) of iron.



GROWTH REGULATION AND WEED CONTROL

Nine studies focused on the use of chemicals as growth regulators, including retardation and herbicial properties. One paper concerned with allelopathy is also included in this section. Control of growth rate by use of applied or natural chemical components of the grass has wide applicability. Range of growth control varies from retardation that decreases mowing to stimulation that improves vigor to stimulation or retardation that selectively eliminates other species.

EFFICACY OF REDUCED RATES OF PREEMERGENCE HERBICIDES FOR CRABGRASS CONTROL IN TURF IN THE TRANSITION ZONE

University of Maryland (Dernoeden)

Although decades of research have shown that preemergence herbicides effectively control crabgrass, confusion exists regarding effective initial and sequential application rates, as well as efficacy of reduced rates for season-long control in the transition zone. Trials in 1980 included recommended rates of benefin 25G, bensulide 4EC, DCPA 75W, oxadiazon 2G, and siduron 50W. A single application of bensulide and oxadiazon and a sequential rate of DCPA provided an acceptable level of control. Reduced rates applied in 1981 were efficacious for oxadiazon (onehalf rate) and for bensulide used in sequential dosages (onehalf rate). In 1982 sequential, recommended dosages of benefin and DCPA and reduced rates of oxadiazon gave excellent control. Oxadiazon provided best, consistent control as rates were reduced. Single applications of benefin,DCPA and siduron were ineffective all three years of the study.

POSTEMERGENCE HERBICIDE CONTROL OF CRABGRASS IN THREE TURF SPECIES

University of Arkansas (Miller,King)

MSMA is the main herbicide used for postemergence control of crabgrass. Repeat applications are required and temporany injury to the turf is common. Tall fescue, creeping bentgrass and common bermudagrass turf were used to compare MSMA with DOWCO 453, sethoxydim and fluazifop-butyl. Single applications and repeat treatment at 7 to 10 day intervals were made. All treatments caused unacceptable injury to creeping bentgrass and tall fescue. All compounds caused some injury to common bermudagrass. Degree of discoloration varied with treatment and rate. Single applications of DOWCO 453 gave best comination of crabgrass control with acceptable bermudagrass injury.

INFLUENCE OF ETHOFUMESATE AND OXADIAZON ON SPRING RECOVERY OF BERMUDAGRASS

Auburn University (Dickins)

Ethofumesate is used to control annual bluegrass in bermudagrass overseeded with ryegrass. Late winter applications have caused some slowness of spring recovery of the bermudagrass. Oxadiazon applied during the spring for control of goosegrass can also injure bermudagrass. Tests indicated no interaction between the two herbicides. Ethofumesate applied in late February followed by an application of oxadizon in April had no effect on spring recovery of bermudagrass. Rate of application for both herbicides was 0.75 ounce per 1000 square feet (2.2 Kg/ha). Early April applications of oxadiazon caused slight initial thinning of the perennial ryegrass but recovery was rapid.

THRESHING THE JOURNALS

CONTINUED

EFFECT OF ETHOFUMESATE ON ANNUAL BLUEGRASS CONTROL IN OVERSEEDED BERMUDAGRASS TURF

University of Georgia (Johnson)

Dates and frequency of ethofumesate treatments for annual bluegrass control in bermudagrass were studied in a two year test. Bermudagrass plots were either not overseeded or overseeded with Medalist VI perennial ryegrass. An application rate of 1.1 Kg/ha (0.37 ounce per 1000 square feet) was used. Treatments at the time of overseeding in October plus one month later effectively controlled annual bluegrass. Treating in February and March were not effective. Some quality reduction of turf was noted. October and November treatments did not delay early growth of non-overseeded bermudagrass the following spring. In most instances the growth of Tifway was affected less than Tifgreen, Tifdwarf or Ormand. The transition of overseeded turf back to Tifway bermudagrass in the spring was not severly affected by ethofumesate.

CHEMICAL SUPPRESSION OF SEED PRODUCTION AND SHOOT GROWTH ON ANNUAL BLUEGRASS

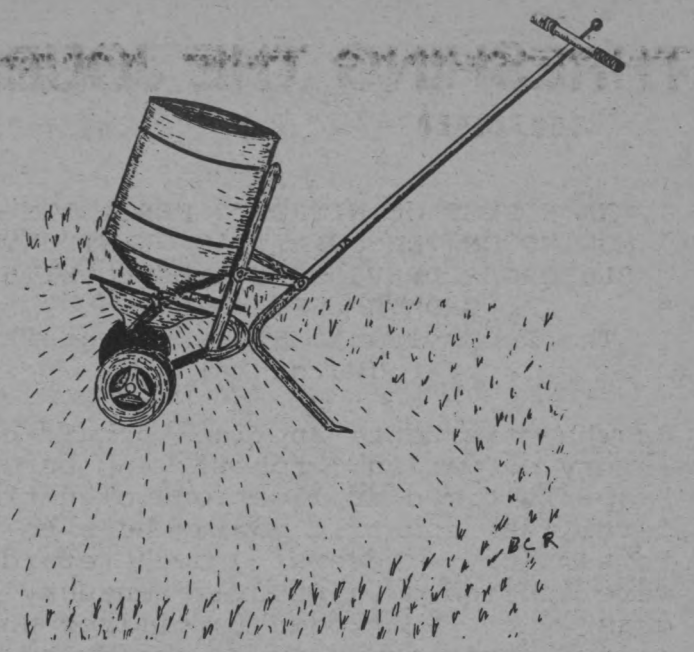
Cornell University
(Petrovic, White, Kligerman)

The effects of several chemicals on seedhead and shoot growth suppression and visual quality of annual bluegrass were examined. When treated in April, (before first mowing) or May (first seedhead), mefluidide (Embark 2-S) plus wetting agent suppressed total seed production 79 and 30 percent respectively. Both materials were more effective in suppressing seed production halfway through the flowering period (92 and 42 percent respectively) indicating a need to retreat in late May. Mefluidide reduced total clipping yields 38 percent and adversely affected quality for the first ten weeks. Ethephon (Ethrel) had no effect.

GROWTH RETARDANT EFFECTS ON THREE TURFGRASS SPECIES

Iowa State University (Christians,Nau)

Embark and ethrel were compared with an experimental BASF Wyandotte Corp material on Baron Kentucky bluegrass, Kentucky 31 fescue and Reliant hard fescue to evaluate variation in growth response. Clipping weight was reduced for all three species by each of the growth retardants, except for an increase in tall fescue in response to ethrel. Ethrel applied at 2.24 Kg/ha (three quarters ounce per 1000 square feet) reduced growth of Baron without seriously affecting quality. It stimulated root and rhizome development. Variations occurred among species in turf quality.



EFFECT OF GROWTH RETARDANTS, TRAFFIC, GIBBERELLIC ACID AND NITROGEN ON FINE FESCUE

The Pennsylvania State University
(Breuninger,Watschke)

Turf areas treated with growth retardants may be predisposed to traffic injury because of reduced recuperative potential. Chemicals or cultural practices which counteract growth suppression would be beneficial in promoting stress recovery. The influence of gibberellic acid and nitrogen on the stress recovery of fine fescue treated with growth retardants was investigated. Following treatments with growth retardants, a predominantly fine fescue golf course rough was subjected to concentrated golf cart traffic for two weeks. Then treatments to stimulate growth were made (June). Gibberellic acid and gibberellic acid plus nitrogen provided the greatest stimulation of foliar growth. Nitrogen and gibberellic acid plus nitrogen improved turf appearance. Gibberellic acid response was not sustained after mowing. Nitrogen response persisted. New growth retardants may have an overriding effect on the gibberellic acid.

ALLELOPATHY AMONG ANNUAL BLUEGRASS, KENTUCKY BLUEGRASS AND PERENNIAL RYEGRASS SEEDLINGS AND MATURE FIELD TURFS

The Pennsylvania State University
(Brede,Duich)

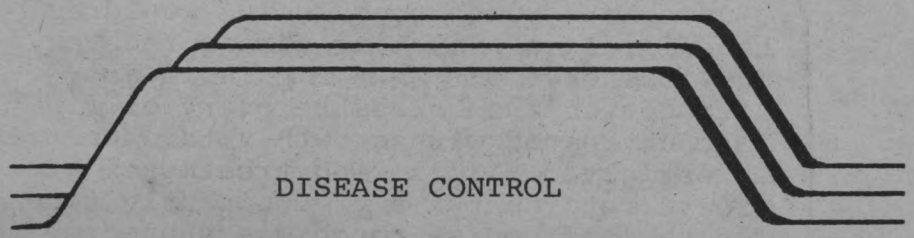
Researchers have implicated allelopathy in the interaction of cool-season turfgrasses, annual bluegrass, Kentucky bluegrass and perennial ryegrass. The effect of one plant on the growth of another as a result of the transfer of a chemical agent was evaluated by means of a series of laboratory germination tests. Plant interactions occurred in the field. Thirty seven of the eighty four different records taken on the parameters of the field turf indicated allelopathic effects on one or more of the three receptor species. Approximately half of the effects were beneficial to the receptor, the rest were detrimental. For example, Kentucky bluegrass seed germination was lower in the presence of annual bluegrass seedlings. Seedling root and shoot growth of all three species was affected by the nearby seedlings of the other species.

THRESHING THE JOURNALS

CONTINUED

THE EFFECT OF NITROGEN FERTILITY AND MOWING ON THE QUALITY OF KENTUCKY BLUEGRASS PREVIOUSLY TREATED WITH GROWTH RETARDANTS
The Pennsylvania State University
(Watschke)

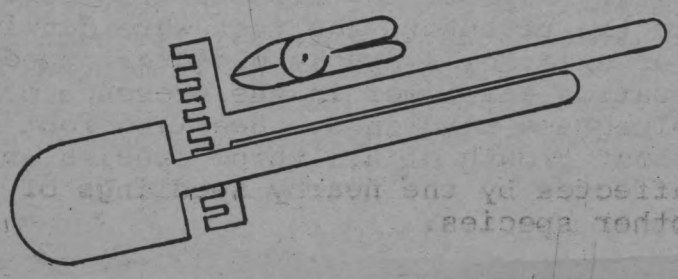
Growth retardants applied to turf cause injury of varied intensity and duration. Properly timed applications of nitrogen fertilizer and trim mowing help to reduce this injury. Several growth retardants were applied to a natural Kentucky bluegrass turf. Nitrogen fertilizer and an initial trim mowing were scheduled seven weeks after use of the growth retardants. All growth retardants reduced growth. Application of nitrogen and trim mowing improved the color of all treated turf, but reduced the duration of chemical growth suppression.



Four research reports considered turfgrass entomology and pathology. Although insect and disease proneness of turfgrasses have been researched for many years, new methods of control and improved understanding of cultural practices that promote resistance are reported each year.

RESPONSE OF KENTUCKY BLUEGRASS CULTIVARS TO STEM RUST
University of Nebraska
(Watkins, Shearman, Riordan)

Stem rust prevalence and rate of rust development were recorded for eighty four Kentucky bluegrass cultivars and experimental lines in the National Bluegrass Test. Twenty two entries were severely rusted, having a rating of 7.5 (75 % of leaves infected) or greater. Stem rust prevalence on only two entries was less than 2.5 (25 % of leaves infected). The experimental mean for all entries was 5.9. None of the entries were free of stem rust. The rate of rust development differed among entires. For most entries stem rust prevalence increased from early August to early September and then began to decline.



THE COMBINED EFFECTS OF STRIPE SMUT OR FLAG SMUT AND OSMOTICALLY-INDUCED WATER STRESS ON VARIOUS GROWTH PARAMETERS OF 'MERION' KENTUCKY BLUEGRASS
Iowa State University (Nus,Hodges)

Vegetatively propagated Merion bluegrass plants were used to test the combined effects of systemic infection by stripe or flag smut and osmotically-induced water stress on various growth parameters of the host. Differences were found between flag smutted, stripe smutted and healthy plants over the entire range of water stress treatments. Growth parameters measured were total plant weight, leaf weight, leaf length, leaf width, leaf area, number of rhizomes, total rhizome weight, root weight, number of tillers, total tiller weight, percentage of total weight partitioned into rhizomes and tillers, respectively and root/shoot ratios.

EFFECT OF CARRIER, RATE AND TIMING OF NITROGEN FERTILIZATION AND FUNGICIDE APPLICATION ON ANTHRACNOSE DEVELOPMENT OF ANNUAL BLUEGRASS
Michigan State University and
Ohio State University
(Danneberger,Vargas,Rieke,Street)

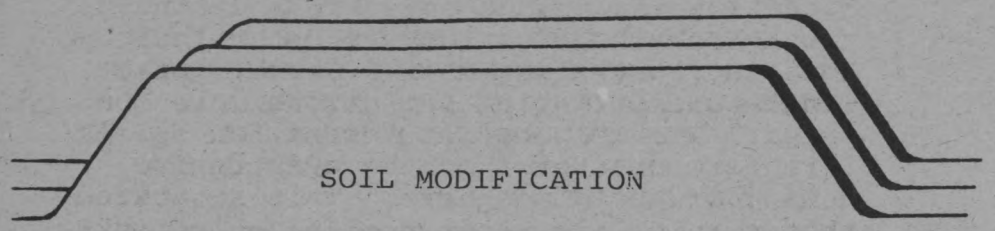
Anthracnose is a serious disease of annual bluegrass golf course fairways in the northern and Pacific-northwestern United States. Nitrogen fertilization and fungicide usage were evaluated for management of this disease. Fungicide, Bayleton, treatments provided the most effective control. With use of this material, infection was reduced from 29.6 and 30.6 to 1.9 and 1.7 percent of the total area in 1980 and 1981 respectively. IBDU, sulfur-coated urea and urea had no effect on anthracnose development. Moderate nitrogen levels 1.46 Kg/are/year (2 pounds per 1000 square feet) were associated with less disease. Nitrogen applied on a schedule of June, July, August, September and November resulted in less disease than nitrogen scheduled in April, May, June, August and September.

INFLUENCE OF TURF ON HABITAT PREFERENCE OF WHITE GRUBS
Texas A amd M University (Engelke,Crocker)

Tifgreen and common bermudagrass, Raleigh St Augustinegrass and Kentucky 31 tall fescue were established in the greenhouse for use in evaluating habitat preference of white grubs. In mid April the sod was transplanted to field sites. The field plots were available for natural oviposition by adult beetles throughout the entire reproductive season. Assessment of habitat preference as influenced by irrigation variables is being related to insect species, and number of larvae present in each treatment, as well as their position and degree of destruction evident in each plot.

THRESHING THE JOURNALS

CONTINUED

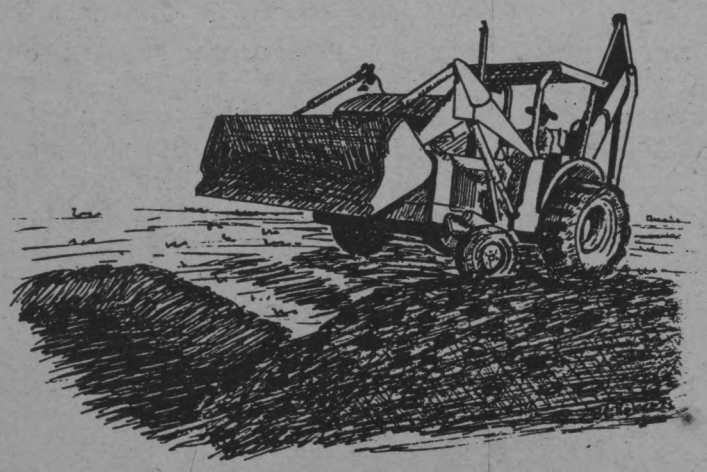


SOIL MODIFICATION

Three presentations considered the matter of soil modification in relation to turfgrass establishment and culture. Much of the success enjoyed in turfgrass management is related to proper preparation and construction of the seed bed and root environment. These research reports are directed towards improving soil conditions for turfgrasses.

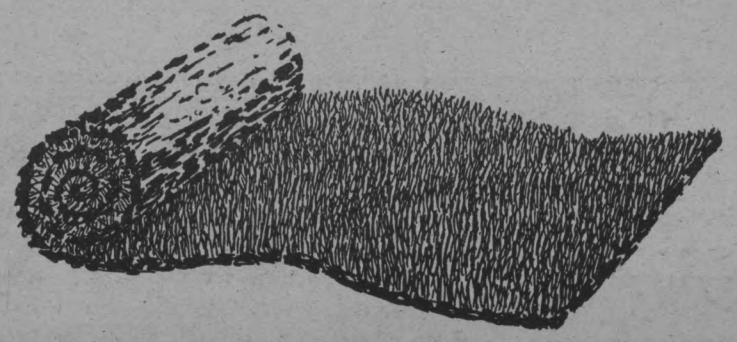
SENSITIVITY OF SAND, SOIL AND PEAT PROPERTIES ON THE RESULTING TEXTURE OF MODIFIED SOIL MIXTURES
University of Minnesota (Taylor,Blake)

Mixing of sand, soil and peat by a contractor so as to provide a specific texture depends on calculations based on the analysis of the individual components. Variations in mixing volumes of components, texture of the soil, amount of sand in the peat and bulk densities of components have an effect on the sand content in the resulting mixture. The volume ratio of materials needed to obtain a specified sand content varied considerably depending on the texture of soil used in the mixture. For example, to achieve a sand content of ninety percent by weight in the mixture, a clay loam soil required a sand-soil-peat volume ratio of 8-1-1. If a sandy loam soil was used, the sand-soil-peat volume ratio would be 3-1-1. In comparison to sand content of the soil and variation of the sand-soil-peat ratio, variables such as bulk densities of components and sand content of the peat had only minor effects on the sand content of the resulting mixture.



RATE OF LATERAL WATER MOVEMENT THROUGH A DRAINAGE BLANKET
Independent Iowa Research (Calhoun)

Drainage blankets are often used beneath the growth medium. The conventional two layer blanket is quite difficult and relatively expensive to construct. A single layer system of very coarse sand was developed as a satisfactory drainage blanket. Using concrete sand, water could be removed at approximately one inch (2.5 cm) per hour over a distance of nine feet ten inches (300 cm). Although this would not be adequate for heavy rainfalls, it would provide satisfactory drainage under most conditions.



CLINOPTILOLITIC ZEOLITE: A NEW MEDIUM FOR TURFGRASS GROWTH
University of Arizona
(Pepper,Ferguson,Kneebone)

Clinoptilolitic zeolite is a natural mineral available as sand sized particles, yet possessing cation exchange capacities in excess of 120 meg/100g. Growth of Tifgreen bermudagrass was excellent on washed mortar sand amended with ten percent zeolite. Zeolite reduced leaching losses of both ammonia and nitrate nitrogen. The water holding capacity of sand increased with increasing zeolite amendment. Germination and establishment of Penncross creeping bentgrass was superior on zeolite amended sand as compared with sand alone. Biomass production and nitrogen use efficiency increased with zeolite. A delay in nitrification in the presence of zeolite brings about slow release characteristics. Turfgrass quality was at a maximum on five or ten percent zeolite amended sands, depending on the season and the nitrogen times zeolite interaction. Zeolite has physical and chemical characteristics which may improve turfgrass growth under minimum energy inputs. Its high sodium content must be taken into consideration in use specifications.

THREADING THE JOURNALS

WATER USE AND CONSERVATION

Five research reports presented the latest information on turfgrass water use and conservation. With as much as fifty percent of urban water usage going for irrigation, it is important to know lawngrass requirements. Radiant energy, vapor pressure, temperature, wind and soil moisture supply are all important in loss of moisture from both soil and turf. Water use per day varies considerably from a half inch per day (12 mm) to one seventh of an inch per day (4 mm).

ESTIMATING TURFGRASS EVAPOTRANSPIRATION WITH TENSIOMETER CONTROLLED IRRIGATION
University of Florida (Augustin,Snyder)

Evapotranspiration may be determined utilizing a tensiometer controlled irrigation system. Plots irrigated with four, quarter cycle spray heads were tied in with tensiometers attached to electric solenoid valves that controlled irrigation based on soil moisture tension. The amount and frequency of irrigation was read from a separate elapsed time indicator for each valve. Turgrass evapotranspiration was then estimated from the irrigation rate. This procedure is only effective during periods without rain, and a minimum of two tensiometer controlled irrigations are necessary to estimate evapotranspiration.

CANOPY TEMPERATURE BY THERMAL INFRARED MEASUREMENT FOR EVALUATING TURFGRASS WATER AND ENERGY BUDGETS
USDA-ARS (Feldhake)

The relation between turfgrass canopy temperature and evapotranspiration was evaluated under Colorado conditions. Canopy temperature had a linear response for evapotranspiration reductions up to fifty percent under both water limiting and energy limiting conditions. Canopy temperature proved to be a reliable indicator of relative water use under a variety of typical urban lawn conditions. The influence of percent live canopy biomass, border effects, mowing height and albedo on canopy temperature were measured. In general, the higher grass was clipped, the more water used. A drop in temperature occurred when a change from high cut to low or from low cut to high was initiated. There was a lack of thermal conductivity into the ground. Warm season grasses used twenty three percent less water than cool season grasses. This may be related to stomatal characteristics.

HOME LAWN SPRINKLER EVALUATION FOR URBAN WATER CONSERVATION
Texas A and M University (Gerst,Wendt)

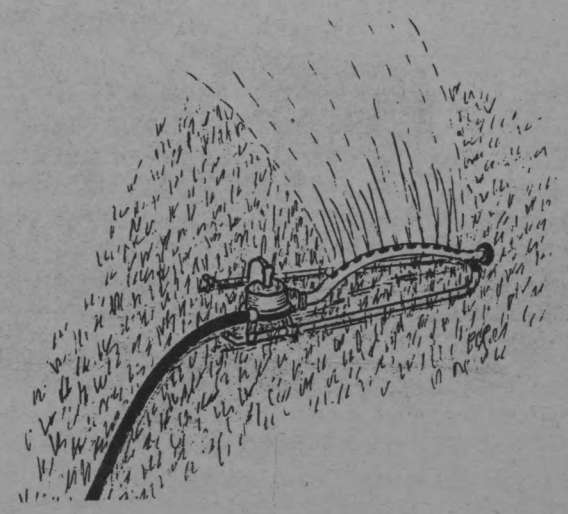
Water loss from lawn sprinklers during a twenty four hour period was determined. Rotating, traveling, buried head, impact, ring and oscillating sprinklers were compared. The evaporation losses for sprinklers were greater than the evaporative demand of the atmosphere. This suggested that much of the water applied by sprinklers is rapidly lost from the area of application. All sprinklers lost less water to evaporation at night than during the day. Sprinklers with the lowest rates of application had the highest percent loss. It is important to obtain a sprinkler that will apply water at the higest rate possible without having run off losses, because evaporation losses are related to the time that is required to apply a given amount of water.

LUXURY WATER USE BY BERMUDAGRASS
University of Arizona (Kneebone,Pepper)

Three high irrigation levels of treated sewage effluent were applied to a 2.5 cm mowed (1 inch) bermudagrass turf. The bermudagrass was overseeded with annual ryegrass in the winter. Water use by the turf increased with water applied and with the fineness of soil texture. Annual use varied from 1279 liters/m^2 (31,397 gallons per 1000 square feet) to 2937 liters/m^2 (75,832 gallons per 1000 square feet). These were equal to 60 and 134 percent of Class A pan evaporation losses for the year.

RELATING IRRIGATION, SOILS AND FERTILIZER TO TURFGRASS GROWING PROBLEMS
MacDill AFB (Lewis)

An experiment was conducted to evaluate turfgrass quality differences with variations in soil, water and fertilization. Tifgreen bermudagrass, Pensacola bahiagrass and St Augustinegrass were grown on loamy sand, sandy loam, loam, silty clay loam and peat. Soil pH varied from 5.2 to 6.9 and the natural rainfall amounted to 24 inches during the 180 day test. A 1-1-1 fertilizer was applied weekly with an application rate of from one half pound to four pounds of nitrogen per 1000 square feet per week. The bahiagrass grew well with only natural rainfall. St Augustine and bermuda grasses required supplemental irrigation. Fertilization produced turf with more stable visual ratings.



THE LAWN INSTITUTE

County Line Road
P. O. Box 108
Pleasant Hill, Tennessee 38578-0108

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

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

Lawn Institute Harvests serves as a quarterly newsletter for members. It also provides a means of communication between Turfgrass Seed and Allied Industries and other organizations and individuals with research and educational interests.

Editor: Eliot C Roberts, PhD

Associate Editor: Beverly C Roberts, MA

Printer: Cookeville Dispatch (Tennessee)