PROCEEDINGS OF THE 1984

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EDUCATION
RESEARCH

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ESTABLISHING TURFGRASS

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Once the seed or sprigs are in the ground, the starting of new grass plants becomes of prime concern. Some few procedures in the creation of an environment suitable for seed germination, rooting of sprigs and establishment of new plants go a long way towards making this an easy and successful venture.

Research results and considerable practical experience indicate that major control of only one factor is most often responsible for successful turfgrass establishment. That factor is moisture. We should consider a few points concerning characteristics of turfgrass seedlings and spriglings that make water relations particularly important. Then note a few of the practices to follow in the creation of optimum moisture conditions for establishment.

Turfgrass Seedling and Sprigling Characteristics

There are four interrelated conditions of young stands that make them particularly vulnerable to moisture stress. These are succulence of tissue, immaturity of tissue, thinness of stand and restriction of root system.

Succulence of Tissue

Young turf has soft water filled leaves that are easily injured by lack of moisture. At the same time, this succulence tends to increase proneness to damping off and other seedling diseases at times when the soil becomes too wet. Thus, in striving to develop young turf, a balance is desirable between plant stress from lack of soil moisture on the one hand, and excess of soil moisture on the other. The more uniform the seedbed environment, the easier it is to realize this balance.

Immaturity of Tissue

Young tissue, including leaf, stem and root, is immature by virtue of the limited growing time following seed germination or sprouting from sprigs. With increased time, these tissues mature and "harden off" and become less sensitive to environmental conditions that induce stress or weakness within the plant system. Thus, this early period of grass establishment is critical for the well being of the plant population. Any and all measures that protect young plants at this time are worthwhile. Of course, cultivars that possess growth characteristics of rapid germination and seedling development have an advantage of promoting maturity of tissue within a shorter time frame so that there is less likelihood of adverse environmental changes.

Thinness of Stand

Seedling turf is characterized by thin stands, more or less, depending on rate of seeding, cultivar or cultivars selected and rates of germination and seedling development. Thin stands of grass leave exposed soil. Loss of moisture by evaporation from the soil, in combination with loss of moisture from succulent leaf tissue by transporation, can easily reach levels that induce moisture stress. This combined process of moisture loss is measured as evapotranspiration. Unusually high levels of evapotranspiration are often the cause of seedling turf failure. Vegetative propagation of grasses creates low initial population density. Overseeding with companion grasses, such as fine fescues, helps develop an improved environment for the slower spreading types.

Restriction of Root System

Because young turf stands have shallow, undeveloped root systems, simply because of insufficient time for more adequate proliferation, they have a smaller volume of soil from which to absorb water to maintain the relatively high demand of young, growing leaves. Thus, the combination of increased evaporation from exposed soil and shallow roots near the soil surface create ideal conditions for the development of moisture deficit.

Practices for Optimum Seedling Moisture

With this brief notation of seedling and sprigling characteristics before us, it becomes useful to consider several practices that can be implemented to create and maintain optimum seedling moisture relationships. These may be grouped in four categories. The first is seed related practices and includes such items as use of pregerminated seed and/or use of companion grasses. The second is cultivar selection and includes such matters as rate of growth, use of early mowing practices and weed, insect and disease relationships. The third is soil related influences and includes irrigation and natural rainfall variables associated with soil moisture holding capacity, use of mulches or other soil protectants, and wetting agents. The fourth is climatic influences, including light, wind, temperature and humidity, most of which are subject to only limited modification in a given landscape.

When theory and practice are put together, the result is a favorable soil plant relationship. Successful farmers develop such relationships for each crop grown. This is also necessary in turfgrass establishment.

USGA AND RESEARCH

James F. Moore, Agronomist
USGA Green Section, Mid-Continent Region

Without research, turfgrass management as we know it today would be virtually non-existant. Golf courses would probably still resemble the pastures and fields on which the game originated.

The United States Golf Association has supported research efforts concerning the golf industry since 1920 through its Green Section. The Green Section was formed "for the purpose of collecting and distributing among members information of value respecting the proper maintenance and upkeep of golf courses." This same goal exists today. Over several million dollars has been directed toward effective and meaningful research on the behalf of the industry.

The success of this effort is made possible by a distinct set of events. First, the professionals in the field identify problem areas and convey their findings to the Green Section staff. Research projects are then framed to meet such practical needs. Funds are obtained and granted to trained scientists and researchers expert in the areas to be studied. Through the efforts of the researcher and the USGA staff, possible solutions are tested under playing conditions. Courses are the direct beneficiaries of this program.

Through the efforts of USGA sponsored research many significant advances in turfgrass management have been realized. These advances range from the development of new turfgrass varieties to the proper construction of a putting green. Many of the "standards" found on the courses of today are the direct result of this combined "team" effort.

Support of ongoing research is also extensive. Researchers are actively working to provide needed answers concerning stress mechanisms, turfgrass breeding, cultural practices and the development of a computerized turfgrass library.

Research has long been accredited with the success enjoyed by our industry today. The USGA has supported these efforts in the past and will continue to do so in the future. All who benefit from this effort must realize they too have a duty to support the future of our industry.

THE COMPUTER AND THE GOLF COURSE SUPERINTENDENT

James G. Prusa, CGCS
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Over the past several decades the business of golf has undergone tremendous increases in the complexity of both management and financial operations. With an exponential explosion of information available and necessary to manage golf courses coupled with the increasing scarcity of capital, better information management and cost control are no longer options -- they are requirements.

Throughout our society and various industries more and more people are looking to computers to assist in meeting these challenges. Computerization of the golf industry has become increasingly imminent as the costs of computers have dropped to within the reach of clubs and the superintendents who manage the courses. The common use of Electronic Data Processing (EDP) is about to develop within the world of golf course management.

There are those who might suggest they see little application for computers in the growing and managing of a golf course. Of course there were also those who saw little value in replacing the horse with an internal combustion engine or in replacing belts, chains and pulleys with hydraulic motors for propulsion.

As with any other tool made by mankind, there are things computers can do and things they can't do -- at least right now. There are many aspects of computerization which will be explored in this presentation, but what is important is how we can make computers work for us and not hinder us.

Computers can help by providing the accurate information you need instead of data you don't. Computers can help make you a more informed and confident decision maker -- as those who have had experience with EDP can testify.

FERTILIZING TURFGRASS

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Fertilization is the practice by which essential plant nutrients are supplied as part of a turfgrass cultural program. As a science, it differs from the study of plant nutrition in that fertilizers do not normally include those nutrients that are readily available from organic and inorganic soil constituents. The principal nutrients supplied through conventional fertilizers are nitrogen, phosphorus, and potassium. Of these, nitrogen is typically used in the largest quantities, with the number of applications varying from two to seven or more times per year.

Potassium is the next most important nutrient. Its usage varies from one-fourth to three-fourths of the nitrogen rate, depending upon soil conditions, turfgrass genotype and climate. Of the macronutrients, phosphorus is required in the lowest amounts. For established turfs, one-fourth of the nitrogen rate is satisfactory, and much lower rates may be adequate for soils with substantial phosphate reserves. Phosphorus fertilization is generally recommended when establishing new turfs, regardless of soil phosphorus levels, to ensure that it is not a limiting factor in the development of the new turfgrass community.

Secondary nutrients include calcium, magnesium and sulfur. In soils sustained within a suitable pH range (6.0 to 7.0), calcium is usually present in sufficient quantities to support turfgrass growth. Similarly, magnesium is usually present in sufficient quantities, although exceptions may occur. Where soil pHs below 6.0 exist, lime containing calcium and magnesium carbonates (or oxides,hydroxides) can be used to raise the pH and to ensure that sufficient quantities of these nutrients are present. Sulfur usually occurs in small quantities in the soil, principally within the organic fraction.

Applications of sulfate-containing fertilizers, including ammonium sulfate, calcium sulfate (contained in superphosphate, gypsum), potassium sulfate, and ferrous sulfate, usually ensure that sufficient quantities are present to sustain turfgrass growth. Where these or other sulfur-containing fertilizing carriers are not used, sulfur deficiencies may occur, especially where soils occur with low concentrations of organic matter.

Micronutrients, or nutrients required in very small quantities by plants, include: iron, manganese, zinc, copper, boron, molybdenum and chlorine. Iron deficiencies may be evident in high pH soils due to the reduced solubility of iron that occurs with increasing pH. Turfgrasses that are especially prone to "iron chlorosis" are bahiagrass and centipedegrass; however, all turfgrasses may exhibit iron deficiency symptoms where iron availability is severely limited by unfavorable soil pH levels. Symptoms of manganese deficiency have been observed in coastal regions of Florida and other southern U.S. locations. Copper deficiencies have been reported as well, but these are relatively rare. As a general rule, where turfgrasses do not respond as expected to macronutrient fertilization, comprehensive soil tests should be used to determine if specific secondary or micronutrient deficiencies could account for unfavorable growth.

Nutrient Balance Analysis

Turfgrasses respond to the available pool of nutrients in the soil. Fertilization requirements should be based upon an analysis of factors that influence the quantities of available nutrients contained within this pool. WIth respect to nitrogen, it is added to the pool by: atmospheric deposition (perhaps a few pounds per acre per year), decomposition of organic residues, and fertilization. Withdrawal of nitrogen from the pool is by: clipping removal, gaseous loss (i.e., volatilization, denitrification), absorption by plants and other soil inhabiting organisms, entrapment within the lattice structure of expandable clays, and leaching through the soil profile. An analysis of the various avenues of addition and withdrawal reveals the controllable and uncontrollable factors that must be considered in developing a nitrogen fertilization program. For example, incorporation of organic residues into a sandy soil during turf establishment could reduce leaching and possibly gaseous losses through improved soil moisture retention. Similarly, selection of slowly available nitrogen carriers in place of soluble nitrogen may reduce leaching and gaseous losses as well. Returning clippings during mowing operations would eliminate the direct loss of the nitrogen (3-5% of clipping dry weight) that would otherwise occur from clipping removal. These measures would effectively reduce the amount of nitrogen fertilizer required to maintain the available nitrogen pool at a level sufficient to sustain acceptable turfgrass color and growth.

Phosphorus is relatively immobile in soil. Many turf soils that have received liberal quantities of phosphorus-containing fertilizers are thus high in total phosphorus. However, the plant-available phosphorus concentration in the soil solution is usually a small percentage of the total concentration due to the rapid rate at which phosphorus becomes tied up in insoluble forms. The phosphate ion combines readily with iron and aluminum cations to form insoluble compounds, especially in acid soils. In many instances, the amount of available phosphate in the soil is surprisingly low compared to the amount removed by actively growing turfgrasses. This is apparently due to a dynamic equilibrium between soluble and insoluble forms of phosphorus; as the available pool is reduced by plant uptake, some of the insoluble phosphorus becomes soluble at a sufficient rate to sustain turfgrass growth requirements. On many turfgrass sites where clippings are not removed, there may be no need for phosphorus fertilizer as long as the residual supply, including that from previous fertilizations, is adequate.

Potassium is readily soluble in water, and thus highly prone to leaching in sandy soils. In most soils with high clay content, however, potassium is retained in large quantities. Most of the soil potassium is in an unavailable form; it occurs as a constituent of soil minerals such as orthoclase feldspar and considerable amounts of potassium may be fixed between clay layers of illite and vermiculite in the same way ammonium ions can be fixed. Plant available potassium occurs in the soil solution (soluble K) and on exchange sites (exchangeable K). Conversion of unavailable potassium to available forms occurs slowly as minerals solubilize and some fixed potassium is released. Where clippings are removed with mowing, potassium may be depleted from the soil unless sufficient quantities are added through fertilization. Because of "luxury consumption" (i.e., plants absorb more potassium than that needed for normal growth as more is supplied), potassium applications should be made several times in small amounts rather than just once in large amounts during the growing season, especially for sandy soils or where clippings are removed. On sites where clippings are not removed and nitrogen fertilization levels are low, and soil potassium levels are high, very little potassium may be required in the fertilization program.

In may locations, secondary and minor nutrients are available in sufficient quantities in the soil so that additions through fertilization are unnecessary. Where specific deficiencies exist or where favorable responses occur from the application of these materials, macronutrient fertilizers should be supplemented with these nutrients to obtain optimum growth and color from fertilization.

RENOVATION OF TURFGRASSES

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Why renovate a turf stand? This question should first be asked and the answers examined regarding the process of renovation because, after all, this activity is a major expenditure of labor, equipment, supplies, and time for most turf facilities. Reasons to renovate include:

1) Poor original grass selection with all problems and expenses related thereto;

2) Injured and/or reduced turf stand from pest activity, chemical damage, equipment damage, or excessive wear; and

3) Complete, or nearly complete, coverage with weedy grasses or broadleaf weed species.

In all instances of renovation, it is assumed that there is not the need to regrade for drainage or retill to eliminate soil layering because a definition of renovation is as follows:

> Renovation is the practice of changing an existing turf, that is inferior because of weed or other undesirable turf species, into a sward of desirable turf color, density, texture, uniformity, and freedom from pests, without completely rebuilding the turf.

Often a turf site does not reach the stage of needing renovation unless mistakes were made either in the selection of grasses to be originally established or in the cultural practices performed on these grasses. Therefore, at the time of renovation, it is wise to consider the need for changing species/blends/mixes and the need for altering cultural practices that will insure the growth and development of the chosen grass(es).

The ultimate choice of the species, varieties, blends or mixes, of course, will be governed by edaphic and climatic conditions of the site, the use the area will receive, and the maintenance level that will be practiced. The mowing height and frequency, the fertilizer amount and timing, and the irrigation frequency and duration must be designed and implemented for the chosen turfgrass.

The choice of grass(es) to reestablish will govern the correct time of renovation. Cool season turfgrasses, including Kentucky bluegrass, perennial ryegrass, the tall and fine feacues, and the bentgrasses should be seeded in a renovation program performed either late summer to mid-autumn (depending on climate) or in mid to late spring (depending on climate). Conversely, renovation for warm season grasses, such as common and hybrid bermuda, St. Augustine, zoysia and seashore Paspalum, should be practiced from mid-spring to early summer, depending on climate of an area.

The steps needed in a specific renovation program must be determined based on the characteristics of the site; however, general guidelines would be as follows:

1) Eradicate undesirable species. Use selective herbicides for broadleaves and weedy grasses when a significant stand of the desired species/variety remains. A non-selective herbicide is used when total renovation of the sward is required. The following steps should be performed at the correct time following chemical treatment based on label recommendations.

2) Close mow, remove thatch. The turf should be mowed closely and thatch removal practiced if the turfgrass plants or thatch will interfere with seed/soil contact (in the overseeding step). Remove trash.

3) Cultivate. If the soil is compacted or is characterized by surface soil layering, the area should be cored several times. A light vertical mowing will break cores. Rake or drag and remove trash.

4) Fertilize. Apply fertilizer based on need determined by soil test. Alter pH if necessary. Rake in or combine fertilization with cultivation step above to incorporate fertilizer/lime in coring holes.

5) Apply seed. Rake or drag seed into duff. Use correct seeding rate.

6) Irrigate. Keep the seed moist until they germinate, then reduce irrigation frequency while increasing duration to match the maturation stage of the sward.

7) Mow. Mow as soon as the establishing or established turf plants are 1/3 to 1/2 inches higher than the desirable cutting height. Mowing frequency thereafter can be governed by the same rule.

8) Cultural practices. Again, the mowing, fertilization, and irrigation programs should be planned for the new turfgrass stand.

CHARACTERISTICS OF TURF HERBICIDES

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Herbicides are chemicals that kill plants or greatly inhibit their growth. There are about 20 such chemicals currently registered for controlling weeds in turf. To use these chemicals effectively, it is necessary to know and understand their characteristic properties. It is also necessary to know the turfgrass species involved, and to correctly identify the targeted weed species. From a practical viewpoint, it is necessary to know the following characteristics about a turf herbicide before its purchase and application:

(a) Is it safe to use on your turfgrass species or cultivar?

(b) Will it control your problem weeds?

(c) When must it be applied relative to weed and turf growth?

(d) Is it a contact-type or translocated herbicide?

(e) Is it applied as a spray or as dry granules?

(f) What effect does rainfall or irrigation have on its activity?

These characteristics may be summarized as: (1) <u>selective or nonselective</u>, (2) <u>soil or foliar applied</u>, (3) <u>contact or translocated</u>, (4) <u>type of formulation</u>, and (5) <u>effect of rainfall or irrigation following application</u>.

Selective herbicides kill some kinds of plants but not others. The herbicide chosen for use should not cause significant injury to the turfgrass species, but, at the same time, it must provide adequate control of the problem weeds. The product label of a respective herbicide provides pertinent information relative to tolerance and susceptibility of turfgrass and weed species to that product. The following examples illustrate selectivity: (a) Siduron (Tupersan 50W) may be used safely in new seedlings of bluegrass, perennial ryegrass, and zoysia but not in new seedings of bermudagrass, (b) Oxadiazon (Ronstar G) effectively controls goosegrass (<u>Eleusine indica</u>), a grass weed, growing in grass turf, (c) Bromoxynil (Nu-Lawn Weeder, Brominal, Buctril), controls emerged prostrate spurge (<u>Euphorbia prostrata</u>) without injury to turfgrasses, (d) Benefin (Balan) and bensulide (Betasan) control a broad spectrum of grass and broadleaved weeds growing in grass turf. Selective herbicides may lose their selectivity if applied at a dosage greater than recommended.

Nonselective herbicides kill all (or almost all) green plants. Examples of nonselective herbicides used in turf are cacodylic acid (Phytar 560), glyphosate (Roundup) and paraquat (Ortho Paraquat). These nonselective herbicides are commonly used selectively in dormant established turf to control actively growing weeds.

Soil applied turf herbicides are most effective in killing germinating weed seeds and seedlings pushing their way through the soil. These herbicides are referred to as preemergence herbicides. Preemergence turf herbicides usually have little or no postemergence activity. In general, preemergence turf herbicides do not translocate in plants, but a few, for example ethofumesate (Prograss) and napropamide (Devrinol), do translocate upward via the xylem conduits. Examples of preemergence herbicides used in turf include benefin (Balan), bensulide (Betasan), DCPA (Dacthal), ethofumesate (Prograss), napropamide (Devrinol 5-G), oryzalin (Surflan), oxadiazon (Ronstar G), and siduron (Tupersan 50W). Preemergence herbicides have limitations. For example, applications timed for control of annual bluegrass may be phytotoxic to subsequent overseeding of turf with cool-season turfgrass species. Almost every preemergence herbicide has some adverse effect on the established turfgrass, although this injury may be relatively insignificant. Preemergence turf herbicides do not control established perennial weed species.

Foliar applied turf herbicides are postemergence herbicides applied to the leaves and exposed buds and stems of actively growing weeds. In general, the leaves are the primary target of these herbicides. Foliar applied herbicides may be of the contact-type or they may translocate in plants. In general, postemergence herbicides should be applied when the targeted plants are less than 2 inches tall or when in the rosette stage.

Contact-type herbicides undergo little or no translocation in plants following plant absorption. Due to not translocating, contact herbicides must be applied so as to make contact with all (or most) plant parts. A spray volume of 50 to 60 gallons of aqueous spray mixture should be used to obtain adequate plant coverage. Contact-type turf herbicides include cacodylic acid (Phytar 560), bentazon (Basagran), bromoxynil (Nu-Lawn Weeder, Brominal, Buctril), and paraquat (Ortho Paraquat). Bentazon and bromoxynil are used for selective weed control in turf. Cacodylic acid and paraquat are nonselective contact herbicides, but they can be used to selectively control actively growing weeds in dormant turf.

Translocated herbicides move within plants from their sites of absorption to their sites of phytotoxicity. When applying translocated postemergence herbicides, complete coverage of the targeted weeds is not as important as with contact herbicides, and spray volumes of 20 to 30 gallons of aqueous spray mixture per acre provides adequate coverage. Examples of translocated postemergence turf herbicides include dicamba (Banvel), DSMA and

MSMA (a variety of named products), glyphosate (Roundup), and the phenoxy herbicides 2,4-D, MCPA, and mecoprop or MCPP. These postemergence herbicides are used in established, actively growing turf for selective weed control, with the exception of glyphosate. Glyphosate may be used selectively in dormant turf.

Herbicides are sold to the consumer as formulated products. Thus, the product in the container is a formulation, with the herbicide as its active ingredient. The inert ingredients of a formulation are included so the product will perform for the consumer as expected. Based on their manner of application, turf herbicide formulations are of two basic types: (1) granules that are applied directly (not mixed with water) to the turf, and (2) formulations designed to be mixed with water and then applied as spray. Granular formulations (products) contain soil-active herbicides; they are not intended for foliar absorption. Formulations designed to be applied in aqueous sprays include emulsifiable concentrates, flowables, wettable powder, and those that are water soluble. These products are designed to readily mix with water and be applied as sprays to the soil or to emerged weeds, depending on the characteristics of the herbicide(s) involved.

Water can influence the effectiveness of applied turf herbicides. In general, water enhances the activity of soil applied herbicides, moving the herbicide into the zone of weed seed germination and seedling emergence. Water will encourage seed germination and seedling growth. Too much water moving through the soil may be adverse, leaching the soil applied herbicide past the zone of seed germination and seedling growth, resulting in little or no weed control. In general, weed control is enhanced by 0.5-inch of rainfall or irrigation following soon after the application of herbicides to the soil. Foliar applied herbicides are often so quickly absorbed that they are not adversely affected by rainfall or irrigation occurring within 15 or 30 minutes after application. However, a few foliar applied herbicides may be washed from the foliage by rainfall or irrigation before being absorbed in phytotoxic amounts.

SHADE TREE PROBLEMS IN THE SOUTHWEST

Emroy L. Shannon, Extension Plant Pathologist
New Mexico State University

Shade trees and ornamentals are plagued with numerous parasitic and non-parasitic diseases. Three of the most common plant diseases or disease conditions that occur in New Mexico include: chlorosis problems, zinc deficiency, and powdery mildew. Recognition and control of these problems is a very important part of maintaining golf courses and other areas.

Most golf course superintendents recognize symptoms of iron chlorosis and know that several iron compounds can be used to correct the problem. However, in many instances trees and shrubs do not respond to our iron treatments which may suggest that other causes may be involved. These causes may include: nitrogen deficiency, spring or winter freezes, and misuse of herbicides and other chemicals.

Zinc deficiency is commonly found in several fruit trees, pecan and ash trees; especially if they are growing in sandy soils. Symptoms of zinc deficiency include: 1) lion's tail symptom (a small tuft of leaves at the ends of branches that are otherwise void of leaves), 2) limb die back, 3) chlorosis, 4) small leaves, and 5) "rosette." Zinc deficiency is most easily corrected with spray compounds, although soil applications of zinc chelate may be helpful.

Powdery mildew is the most common fungus problem of trees and other other ornamentals in New Mexico. It is spread by wind borne spores and can become severe during periods of high humidity. It is most commonly found in Euonymus, roses, zinnias, grape, bluegrass, apples and cucurbits.

Not just any fungicide will control powdery mildew. Make sure that the label specifically says that it will control powdery mildew. These fungicides include sulfur, copper compounds, Phaltan, Acti-done PM, Benlate, and systemic fungicides with Benomyl, Funginex and Bayleton.

TURFGRASS INSECTS

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Ground Pearls in Lawns

Ground pearls is a name given to a subterranean scale insect. They belong to the scientific family Margarodidae. The pearl-like shells and waxy cysts that cover the immatures and the females respectively give this insect its common name -- ground pearls. These insects belong to the genus *Margarodes*.

The adult female is a small, soft-bodied insect, often pinkish in color and wingless. They have very short legs with well developed claws. The male is a gnat-like insect varying from 1/25 to 1/3 inch in length. When the eggs hatch the young scale insects start feeding on grass roots, covering themselves with hard globular shells. The whitish, iridescent shells resemble small pearls. As the immature scales grow, the size of the shell increases and may reach 1/8 inch in diameter.

Different sizes of ground pearls may be found throughout the year. The females emerge from their shells when they reach maturity. This emergence usually occurs in May and June. These newly emerged female crawlers move a short distance down into the soil, secrete waxy filaments to cover their bodies and begin to lay eggs. Egg laying generally takes place in June and July while hatch occurs in July and August. After hatching, the young scales attach themselves to grass roots with their mouthparts.

Immediately after attachment, the young scales lose their legs and develop a pearl-like covering around their bodies. Most research reports one generation per year, however it appears that some immature ground pearls require 2 years to mature.

Damage is most evident in early spring and during dry spells. Damage is usually noticed when small, irregular areas of lawn die out or appear unthrifty. These areas usually range from 6 inches to 3 feet in diameter. Soil samples from the upper 3 inches can usually verify the infestations. There is no data to give a relationship between the number of ground pearl per unit of soil and the damage to grass. Ground pearl damage can often be confused with other lawn problems.

Control

Control of this insect pest has been irratic at best. Proper lawn fertilization, irrigation and other good cultural practices will help reduce damage. When establishing lawns with sod, make sure the roots are free of ground pearls.

Timing of insecticidal treatment is critical for ground pearl control. Malathion should be applied when adult females are persent in the soil (May until the first part of June). Insecticide treatments should be applied for 2 consecutive years for effective control.

White Grubs

The white grub is the larval form of an insect commonly known as the May or June beetle. Several species of these grubs can feed on grass roots. Severely damaged grass can be lifted from place by hand or rolled off the ground.

Most white grubs that damage lawns have one year life cycles, however, some grubs may have 2 or 3 year cycles. Generally, the adult beetles emerge from the soil once per year to mate. Mated females then tunnel into the soil to lay eggs. The larvae that hatch from these eggs are the white grubs that feed ravenously on grass roots. The larvae then pupate in the soil just prior to emerging as adult beetles.

During flight periods, large numbers of adults might collect around street lights. These adults are most often males as the females are much less attracted to light. Studies indicate that females often aggregate at the time of egg laying. This can results in localized or clumped lawn infestations.

The egg laying period generally lasts 30 days. The females most often lay from 30 to 40 eggs. The eggs hatch in 3 to 4 weeks. Eggs are deposited at a depth of 2 to 5 inches. The females seem to avoid lawns which have been heavily watered.

Most white grubs pass through three larval stages or instars. The first two instars take only 2 to 3 weeks to complete. The 3rd larval stages remains the rest of the year and causes most of the damage by root feeding. The third instar larvae overwinter in the soil. White grubs with 2 year life cycles do most of their feeding in their second year.

The pupal stage lasts for about 3 weeks. During this time no food is consumed. The pupa can be located in the soil 3 to 6 inches in an earlier cell.

Control

Lawns suspected of harboring grubs should be examined during the critical treatment period (for Las Cruces -- mid July to early August). Take several plugs from the lawn at a depth of at least 4 inches and at least 3 to 4 inches in diameter. Examine at least 1 to 2 square feet. Treatment is usually justified when more than 4 grubs per square foot are found.

Insecticides recommended for grub control are much less effective against eggs and larger grubs than small grubs. The following materials are recommended for grub control in New Mexico: Diazinon, Dursban, Oftanol, Dylox or Proxol.

Proper application is very important. The key to control is getting the chemical to the grubs in the root zone at the proper time. Granular materials are easy to apply with lawn fertilizer spreaders. Proper distribution is important. Make sure the swaths overlap. Follow the applications with a thorough watering.

If spray formulations are used, first water the lawn with about 1/4 inch of water. This will wet the grass and allow for better soil penetration. Apply at least 15 to 25 gallons of water per 1000 feet. Wash the insecticide into soil with 1/2 to 1 inch of irrigation water.

SOD INSTALLATION AND CARE

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I. Sod, sprigs, stolons, plugs and seed

II. Lawn Grass choices

   A. Cool-season grasses

      1. Bluegrass, ryegrass, fine-leaved fescue, bent

         a. Advantages and disadvantages
         b. Sources

      2. Affect on other plant life

   B. Sub-tropical grasses

      1. Bermuda, zoysia, St. Augustine

         a. Advantages and disadvantages
         b. Sources

      2. Affect on other plant life

III. Soil Preparation

   A. Soil pH

   B. Soil water retention

      1. Soil difference between sod and existing
      2. Organic soil amendments

   C. Tools required

   D. General procedure

      1. Incorporate materials in soil
      2. Rake to pull out rocks and weeds
      3. Drag and roll
      4. Application of commercial fertilizer

IV. Laying of sod

   A. Time factor between cut and installation
   B. Thickness
   C. Time allotted
   D. General procedure

V. Care of sod after installation

VI. Long term care

TOGETHER WE MAY BE BETTER FOR YOU

Mike Clark
Director, Parks Department
Albuquerque, New Mexico

Relationship between professional organizations provide each an opportunity to expand their services to the publics they serve. Service, the focal point of any profession needs to be nurtured and fostered in a state such as New Mexico.

The Southwest Turfgrass Conference has long been a recognized professional organization whose primary purpose has been to aid communities and organizations in the development and promotion of grass and soils for lawns, parks and resource areas.

The New Mexico Recreation and Park Association, established in the 1950's, also has that responsibility as one of their goals.

The NMRPA is a professional organization affiliated with the National Recreation and Park Association. A Therapeutic Branch was formed to address the special needs of those working in a therapeutic environment. A Small Communities branch was also added to meet the specific demands of small community administration. The major goals of the Association are:

1) To unite all those interested in the recreation and park movement in New Mexico.

2) To foster and maintain high standards of professional qualifications, training and ethics.

3) To organize all levels of recreation and park personnel for the purpose of promoting, broadening and improving recreational services in New Mexico.

4) To study existing recreation and park legislation and additions and improvements to existing legislation affecting all fields of recreation and parks in New Mexico.

5) To assist in the dissemination of information affecting the field of recreation and parks in New Mexico.

To effectively meet the goals of the organization the NMRPA publishes an official organ, Inroads, six times a year. This publication now has a full time editor and a review board composed of qualified individuals from throughout the State. This has been planned to ensure a vital quality publication. The editor is interested in receiving articles from all sources relevant to the park and recreation profession.

In the past, representatives of the Southwest Turfgrass Association have sent selected papers from the Conference for publication consideration. I am pleased to say several have appeared in past issues. Hopefully, some of you will consider Inroads as a vehicle for publishing not only papers presented at conferences but any others you deem appropriate for park and recreation personnel. I have several copies of Inroads available for distribution.

Another principal objective of the NMRPA is to foster training for professionals in an effort to broaden and improve the human resources so vital to this profession.

The organization periodically conducts workshops for segments of the total population such as Therapeutics, small communities, Aquatic Personnel and administrations. In each case sessions are devoted to planning, designing, implementing and maintaining programs and resources. You as specialists, can assist in the latter area through agreeing to serve as presenters, demonstrators or as participants through cooperative planning in such activities. In this manner both organization will better meet the needs of their publics. Such an arrangement should be reciprocal so that if your organization should desire speakers the NMRPA personnel would be glad to participate in your conference as requested.

Other possibilities for cross fertilization or cooperation might well include possible joint conferences where the program is planned for all segments of the field in attendance. In recent years the NMRPA has encouraged and sought membership from these state and federal sectors and a review of our latest Program indicate the growing involvement by these professionals. There is much Southwest Turfgrass people have to offer other professionals in the planting, care and maintenance of soils and grass for beautiful, yet functional and kid-proof parks and recreation areas.

Perhaps officers of both organizations should sit down and discuss mutual interests, concerns and possible relationships.

After all, to paraphrase Will Rogers Jr.'s famous IGA ad, Together We May Just Be Better for You.

Las Cruces - since 1539

MMSD Slides

- Pie Greens
- Ike Rabbit

Dr. Jim Halligan - Chiles - Pecans

NOTES

Roberts - Listen to the little plants speak.

Major changeover. Food reserves in seed or plant parts to the new roots & photosynthesis

Improve microclimate to protect weaker new plants. A-1 = fescue rubra

Plant rate } 10 - 12 seed / in^2 = 4 - 6 plants / in^2

Soil modification & manipulation

& microbiological system is a cost saver

Bud Best — Rule of 6 - 6 men, 6 weedeaters, 6 hrs/day - 6 days a week

3/4 # N/M/yr Carl Beer

7 yrs supt. 3 asst -

5lbs # 4 MM since 1920

'85 $771 M. Research.

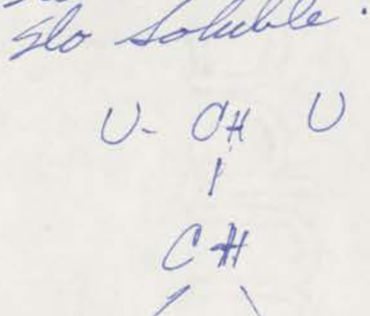
Library MSU	P. annua
Plant Stress	Bermuda
Breeding	Bent. PSO - MSU
Rye + Blue	Cat scan - Shatter Core 14 CH.

Turgeon — Infer many soils contain adequate P supplies. Where?

'Minor': Zn Mn Cu Mo B Cl

1. Slo Release: SCU
2. Slo Soluble: Mil - UF - IBDU

$U = NH_2-\overset{O}{\overset{\|}{C}}-NH_2$



$NH_2-\overset{O}{C}-NH-CH_2OH$ Methol

$NH_2\overset{O}{C}NHCH_2NH\overset{O}{C}NH_2$ Ene

NOTES

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