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# TURF BULLETIN

MASSACHUSETTS TURF  
AND LAWN GRASS COUNCIL  
I N C O R P O R A T E D



FEBRUARY 1967  
CONFERENCE ISSUE

BETTER TURF THROUGH RESEARCH AND EDUCATION

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

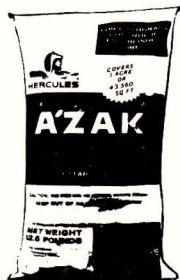
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# Pesticide Compatibility

Prepared For The 7th Annual Illinois  
Turfgrass Conference

MALCOLM C. SHURTLEFF

*College of Agriculture, University of Illinois*

The English language is said to contain some 850,000 words — all composed from just 26 letters. The total of possible English words, using these 26 letters in all conceivable combinations, would number many billions.

At present, there are about 1,200 basic active ingredients used in pesticides (fungicides, insecticides, nematocides, herbicides, miticides, rodenticides, algacides, etc.) now registered with federal agencies in Washington, D. C. Almost 70,000 pesticide trade products, formulated in a variety of ways from these 1,200 basic chemicals, are now registered and being sold in the U. S. Not all of these, of course, are being used on turf. But with English as an example, just think of the countless trillions of possible combinations — compatible and incompatible — there are of putting two or more pesticides together in one unsuspecting spray tank to be applied to a defenseless grass! Besides pesticide combinations, soluble fertilizers and nutritional mixes, wetting agents or spreader-stickers, products to aid in water penetration or to soften "hard" water, anti-desiccants, and other chemicals ad infinitum have been added. The amazing thing is not that turf injury sometimes occurs or that a sludge forms in the bottom of the tank, but the *infrequency* of problems arising from these "witches brews" or "shotgun" treatments. The modern trend of mixing chemicals to apply to turf is hard to beat. As Charley Wilson, agronomist with the Milwaukee Sewerage Commission, once said, "Mixing everything in one pot seems to have more sex appeal than Bridgitte Bardot."

There are three basic types of compatibility (or incompatibility):

- (1) *physical incompatibility* — possibly settling out or poor dispersion in the tank,
- (2) *chemical incompatibility* — a new product is formed or breakdown of the products used, and
- (3) *compatibility of placement* — such as a fungicide-insecticide combination where the fungicide should be on the plant and the insecticide in the soil."

As background for this talk, 90 letters were mailed to active turfgrass pathologists, agronomists, horticulturists, and extension specialists at experiment stations and universities, as well as a broad-spectrum of turf industry dealers, consultants, trouble-shooters, golf course superintendents, sod growers, and chemical company representatives from 35 states and Canada. Questions were asked concerning specific examples of where combinations of chemicals caused either incompatibility (turf injury), or reduced effectiveness. Direct replies of correspondents are marked by quotes. Those that requested credit are listed in parenthesis together with a scientific paper on the subject. A number of workers provided much of the same general material but in different terms or context. We are most grateful

for the many thoughtful replies to our questions.

Over half of the turf workers indicated no concrete knowledge, reports, or follow-ups of problems resulting from the tank mixing of chemicals. Considering the wide range of environmental conditions (e.g., temperature; humidity and dew; grass species; soil type, pH, and moisture, cultural management programs; type of water; altitude), chemicals and strengths used, and methods of application, etc. this is a truly amazing record. There are extremely few, well-documented cases of where combinations of two or more chemicals — that are normally safe on turf when used by themselves — has resulted in turf injury.

Now for some *general principles*:

1. If at all possible, apply chemicals separately. Follow the manufacturer's directions as printed on the package container as regards dosage, method of application, and gallons of water to apply to X number of square feet of turf. Note any incompatibilities and other precautions mentioned on the label. Practically all pesticide companies and turfgrass specialists strongly recommend that pesticides be applied separately and for a specific purpose. As one correspondent noted, "Don't confuse economy in time and labor with effectiveness of the result. Somebody's job — perhaps your own — may hinge on the latter."
2. If you *must* mix chemicals, apply them separately to the spray tank *with the agitator running*. This commonly prevents "settling out" and plugging of spray nozzles. Spray solutions should be applied as soon after mixing as possible. The longer a spray combination remains in the tank, the more problems can arise.
3. Try out all new combinations in a small way at first on some out-of-the-way turf where a little injury won't matter. Whenever possible, include applications of the same products *individually* alongside the combination several times for comparative purposes. Check to see that the mixture performs all of the several functions as well as the materials applied separately. Remember, no chemical manufacturer can possibly test all of his products (as well as those of his competitors) in all possible combinations.
4. Do *not* mix wettable powder pesticides with emulsifiable formulations or a soluble fertilizer. Wettable powder products have a water-mix base; emulsions an oil-mix base. Such mixtures often cause "greasing" or flocculation and reduced efficiency. The "inactive ingredients" in the products — emulsifiers, solvents, surfactants, wetting agents, fillers, etc. — are frequently the root of the problem, not the active ingredients. There are no set rules on this —

it is mostly trial and error. "We see the most injury from the use of emulsion rather than wettable powder formulations of insecticides, in particular." The solvent or emulsifier used is frequently the cause of turf injury. Damage is most common and severe at high temperatures.

Many researchers believe in testing a spray mix by pouring it into a Mason jar or test tube, followed by violent shaking. If a precipitate settles out within an hour or so, or "layers" develop, physical incompatibilities can be expected. Products that cause precipitation or coagulation should not be mixed in the spray tank. You can almost bet your last "Landon for President" button that reduced efficiency, nozzle plugging, or injury will result.

5. Compatibility problems are most acute when products are mixed with strongly acid or alkaline materials, e.g., sulfur, Chlordane, lime, ferrous sulphate, ammonium sulphate or nitrate. A minute or two of testing with pH paper may save you a giant headache. Don't mix alkaline and acidic materials together! *Example*: When iron (ferrous) sulphate is mixed with a product of high pH, "the iron may settle out or form agglomerates and will not supply the needed iron to the turf."
  6. Store chemicals only in their original containers that are tightly closed and where contamination cannot occur. Be sure to clean out sprayers, hose lines, nozzles, and mixing containers thoroughly after each use. Follow manufacturer's directions. Numerous cases of turf injury or "incompatibility" can be traced back to contamination of equipment with potent weed-killers.
  7. Don't mix a foliar fungicide or insecticide with fertilizers or other chemicals that require watering in. Remember that many disease-causing organisms and insects attack the grass blades.
  8. Don't mix mercurials, inorganic and organic or phenyl, with other products (especially strongly acidic materials such as those containing sulfur, Chlordane, or chlorides, liquid fertilizers — particularly those containing phosphate or potash, and ionic wetting agents). Even using muddy or "hard" water can reduce the efficiency of organic mercury materials. See also item No. 20.
- The "safening effect" of thiram on organic mercury fungicides is widely believed. PMA-thiram mixtures are known to reduce phytotoxicity to Merion Kentucky bluegrass which is sensitive to PMA, especially at temperatures above 60° to 70° F. "A water-insoluble thiram-organic mercury complex is formed in the spray tank," that "cuts down solubility and volatility of mercury and its penetration into grass leaves. — All the mercurials examined, PMA, Panogen, Emmi, Phimm, Semesan, and mercuric chloride, form water-insoluble mercurials with thiram." "In general, this is O.K. for diseases such as brown patch which occur at high temperatures but is not so desirable for cool weather diseases where it is better to use the products separately."
9. Don't mix chemicals which may be individually phytotoxic with other materials. Such combinations frequently injure grass at considerably

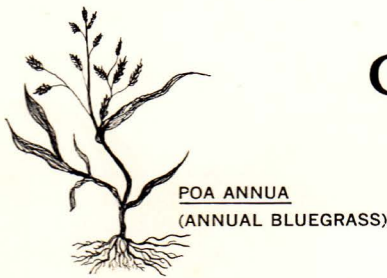
lower concentrations than any product in the mix. Grass may also be "predisposed" to disease (brown patch) by previous applications of herbicides and nematocides, e.g., 2,4-D, Zytron, Dalapon, D-D, DBCP (Nemagon), etc. The results are not due to the incompatibility *per se*, but rather similar to it (Peterson, California).

10. Commercial products which are a mixture of ingredients (e.g., Ortho Lawn and Turf Fungicide or Ortho Lawn Disease Control, Tersan OM, Thimer, Kromad) "embody considerable research experience to develop. The complexity of the mixture is almost exponential and set rules are hard to come by." Many commercially-prepared mixes, that are tested by experiment stations and by golf course superintendents, are never sold due to reduced efficiency, short shelf life, etc.
11. "The addition of soluble fertilizers to a pesticide mix can create a "salting cut" effect, impairing emulsification or suspension of other spray chemicals."
12. "Some turf injury and/or thinning (followed by weed invasion) attributed to herbicides, especially pre-emergence crabgrass controls, is actually due to fertilizer carriers used in the herbicides."
13. Turf that is in a low state of vigor (e.g., from an imbalance of N, P, K, or other elements, winter injury, excess or lack of water, poor soil mix, lack of roots, disease or insect injury) is more easily injured by chemicals and mixes than vigorous turf.
14. Buy pesticides only in amounts that you expect to consume in the current year. Different fungicides and insecticides vary in the length of time they are stable in the package on the shelf — especially once the container is opened. It also makes a difference what manufacturer formulated the product since the emulsifier, solvent, or wetting agent may be responsible for reduced effectiveness over a period of months or years. Storage conditions may be important, too.
15. Spraying early in the morning (before 7:30 A.M.) and late in the evening (just before or after dark) frequently results in less turf injury than during "normal" working hours.
16. "Most of the combinations I know that supposedly "safon" a compound or its formulation actually depress the effective fungitoxicity of the active ingredient." *Example*: certain dithiocarbamates.
17. There is also the problem of certain, exceptionally fine fungicides (e.g., zineb, or maneb) inhibiting or killing fungi in the soil and thatch layer antagonistic to a disease-causing fungus (Dollar Spot). "Hence, they favor the development of an injurious fungus and increase disease." When two or more fungicides are combined they may nullify each other "by knocking out antagonistic saprophytes. Also, to some extent it will depend upon the turf ecosystem and the "stresses" that favor a given organism at the time, and this must be taken into consideration when reporting unusual or ineffective results from combinations. Another apparent *example*: Certain combinations of Daconil 2787 and difolatan are believed to predispose turf to

# Can You Work With POA ANNUA?

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In New England, annual bluegrass (*Poa annua*), has been a controversial subject for many years. Should the green superintendent manage for *Poa annua*, or should he try to prevent it? In the South, *Poa* is a winter annual going out in the spring. In the North, where it is at best considered a biennial, it can persist during the warm summer months if properly managed. However, most superintendents in the northern region feel that it is best to prevent this species from infesting their course, thus avoiding the possibility of it going out during the height of the playing season. This report is a summary of the research carried out on annual blue, which presents arguments for and against its use.

*Poa annua* is a native of Europe and was probably introduced into this country soon after settlement of the colonies (15). It has been reported on golf courses on the East coast of the United States from Maine to Florida, west to the Pacific, and north to Alaska (5). Golf courses managers are not the only ones who classify this plant as a weed. It is also quite common in some economic crops, but when growing in row crops it can easily be controlled.

On the golf course *Poa* is primarily a problem in greens. It is also quite common on the other courses that have dropped the height of cut on banks, tees, and fairways. It will persist longer in these areas because the height of cut is maintained higher than the greens. However, these areas require frequent watering which is expensive, but even so, the loss of annual blue from banks, tees, and fairways is not as critical as in greens.

*Poa annua* infestation on banks, tees, and fairways can be reduced by maintaining higher heights of cut, unless bents predominate, less frequent applications of water, and proper fertilization to encourage the permanent grasses and discourage the *Poa* (26).

Annual bluegrass is found on greens where the bents have died because of improper management practices. *Poa* is found in the hollows where compaction has forced the bent out (19). For any reason such as disease, physical turf injury, or chemical injury where the bent is killed, the ever present *Poa annua* seeds germinate and take over. Many a superintendent has had to admit that this weed has saved his job when for some reason the bent on his green died. Good old annual bluegrass, given two or three weeks time and a little cool weather, can make such areas look as good as new. You can take any species of bent seed and sow it to dead areas in greens and it will take two of three months of very patient, kind care (not rough handling) to get the same effect *Poa annua* will give. The question arises however, do we really want to get rid of it?

Like all plants, *Poa* is effected by various diseases. "Melting" of *Poa* during hot weather was blamed on *Helmenthosporium* by Dr. Werham in 1940 (18). Annual bluegrass on putting turf struck

by a disease giving it a reddish color was found to be attacked by *Colletotrichum cereale*, *Helmenthosporium vagans*, and *fusarium* sp. (15). It has been observed to be particularly susceptible to dollar spot when in a starved condition. Also it can be severely infected by both brown patch and gray snow mold.

Another theory is that the amount of topdressing used does not bury the *Poa* seeds, thus preventing their germination, but rather leaves them on the surface to germinate when environmental conditions permit (6).

The effects of fertilizers on *Poa annua* have been widely studied. It is believed by some that it is best to apply fertilizers every two weeks rather than monthly if one wants to keep *Poa* (23). During the month of May one superintendent applied a complete fertilizer at the rate of 15 pounds per thousand square feet, and three applications of ammonium sulphate during the season at 3 pounds per thousand (10). It has been reported that withholding fertilizers containing phosphates and potash discouraged *Poa*, but unfortunately it also discourages bent grasses (6). The avoiding of lush growth by small but frequent fertilizer applications is believed helpful in keeping *Poa* during hot summer weather (9).

The high phosphate content of a 4-12-4 seemed to encourage annual bluegrass (12). Phosphate of ammonia encouraged *Poa* when it was used to overseed Bermuda grass greens in Florida (22). Another superintendent reported *Poa* dies out in summer months on soils low in phosphorus (10). Phosphorus has also been found to encourage seed formation (14).

When *Poa annua* was forced with heavy nitrogen feeding, it turned a beautiful dark green and grew too fast to mature and produced seed heads profusely (5). *Poa* growth was favored by nitrate of soda (5) and urea (15), however, bents respond well to nitrate of soda. Sprague and Eval found that 2.83 pounds of actual nitrogen annually from sodium nitrate or ammonium sulfate decreased the incidence of *Poa annua* 50% or more, while slowly acting nitrogen sources had little effect (15).

Acid forming inorganic nitrogen sources were reported by Sprague and Burton to be more effective than other nitrogen sources in reducing annual bluegrass invasion. It was also found that 60 pounds per acre of nitrogen reduced the seed yield of *Poa annua*. It has been found that invasion of *Poa* into creeping bent was highest on test areas supplied with organic nitrogen (13). Seventy pounds per acre per year of nitrogen was found to favor *Poa* over bent (4). Heavy nitrogen feeding was also found to produce more clippings without increasing the density of the sod (14).

High potash levels have been reported to favor annual bluegrass survival and seed production (14, 15).

One superintendent claims to have kept *Poa* in during the summer by raising the pH above 5.6. To do this he applied 25 pounds of hydrated lime per one thousand square feet, watering it in well (22). Lime has been found to reduce seed head formation of this grass. Acid as well as alkaline conditions are thought by most to be detrimental to *Poa*, while a pH of about 6.5 has been thought to be best (10, 15).

There are many chemicals on the market today that will stop the germination of annual bluegrass seed. Control of *Poa annua* on lawns and other turf areas consisting mainly of Kentucky bluegrass or all of the twenty varieties is possible with most pre-emergence crabgrass herbicides, excluding Dupont's Tupersan. This chemical does an excellent job on crabgrass but will not touch annual bluegrass (7).

As early as 1937 it was noticed that artificial watering seemed to favor the invasion of *Poa annua* (17). In 1942, *Poa* was found to heavily infest fairways that were over-watered; this is just as true today (21). Where practices of heavy watering and low height of cut were introduced on Kentucky bluegrass fairways, annual bluegrass is not most often the dominant grass and such fairways must be constantly watered to keep the annual blue alive during the hot summer months.

From Sprague and Burton's famous paper on *Poa annua*, we get this information on the water-growth relationship. Soils kept at 30% of the water-holding capacity produced very little growth of annual bluegrass, those kept at 40% supported fair growth, and those at 50 to 60% permitted maximum growth. Soils at 70 to 80% capacity permitted fair to poor growth. The water holding capacity of the soil decreased as the experiment progressed since the watering caused compaction of the soil and reduction of the pore space. The soil kept at 80% finally became so compact that water stood in the pots continuously. Despite this fact, *Poa annua* did make some growth (14).

To keep annual bluegrass alive during the summer months, one superintendent had little trouble where he used 55° water from a deep well (8). Others have noticed that the cooler the water used for greens watering, the longer the *Poa* stays in. This also suggests a way of getting rid of unwanted *Poa*. One needs only to devise a system for warming the water used and the annual blue might die out with a couple of hot mid-summer waterings. It is not known whether it is the temperature or the amount of oxygen that is the controlling factor in these observations.

Most superintendents in order to keep *Poa* alive through the summer use frequent afternoon syringings during hot days. Here again it would be interesting to know whether it is the cooling down or the added oxygen in these light waterings that keeps the plant alive.

The day temperatures do not seem to be as detrimental to the *Poa* as do the night temperatures. Annual blue grown at 55° night temperature and kept cut at 1/4 inch produces a good turf even though exposed to day temperatures ranging from 85 to 105°. The less frequently it received the cool night temperatures the shorter the root system became, and the poorer the quality of turf (7).

Even with this information, one knows that there is little that can be done to regulate temperatures by using plantings of tall shade trees to the south of a putting green. The blocking of direct noon-day sunlight has been said to noticeably reduce soil temperatures. Another "trick" that has been used is to pitch a green away from the noon-day sun instead of toward it (7).

Somewhat like water and temperature, topdressing has been related to *Poa annua* in many ways. A light topdressing when the *Poa* is going to seed has been said to improve the putting surface (23). One superintendent gives a special topdressing procedure he uses for *Poa* greens: beginning with the spring topdressing, which is applied as soon as the turf starts to grow, one-third good virgin soil and two-thirds barnyard manure is ground through his spreader and shaken well. To this is added a 4-12-4 mixture. Before spreading the topdressing, he waters the green in sections according to the area he will be able to cover that day. These areas are power spiked, covered with the prepared mix, and matted in as soon as the mixture dries (20).

The control of weeds in golf courses greens is a great deal more difficult than lawn weed control. In controlling weeds in lawns, one must be careful not to injure the desired plants. This is also true in controlling weeds in golf greens, however, one must be even more careful because the desired grass on putting greens is growing just above the survival level. This condition is often due to a short root system and a small amount of top growth. Grass growing as such is very apt to die upon receiving the slightest amount of injury. This is one reason that the control of a weed like *Poa annua* is a very difficult job in turf areas.

The prevention of any weed seed formation is known to be almost impossible. Annual bluegrass seed is spread primarily by the golfers shoes, however, it can also be easily spread by machinery, wind, or water (24, 5). With all these methods of spreading the seed, the plant will also form seed when cut as low as 1/4 inch, thus it is evident that *Poa* is quite a problem. However, with the advent of pre-emergence herbicides, it has become possible to stop seed from germinating and/or growing into normal plants. These herbicides may very well be the answer to *Poa annua* control.

Even though there are many new herbicides on the market, there seems to be only one that will do an effective job of controlling annual bluegrass without injuring the bents. This herbicide, known by the trade name of Betasan and the chemical name of N-(beta-o, o-diisopropyl-dithiophosphorylethyl) benzene sulfonamide. This formulation controls annual blue without harming mature bent or bluegrass turf when applied at the recommended, or even double the recommended rates. However, Betasan will slightly discolor (somewhat like a frost burn) bents for a period of two to four weeks. It must also be properly watered in to prevent leaf burn. While Betasan will not injure mature turf, it will damage seedlings of both bent and bluegrass by preventing normal root development (7).

Another chemical worthy of mention is Gibberellic acid. At UCLA, winter applications of this material, and regular mowings, eliminated *Poa annua*.



Most of the *Poa* was eliminated when the Gibberellic acid was used at 100 parts per million and applied every three weeks from the middle of November to February. Younger suggested that *Poa* was unable to withstand regular mowing-off of the excessively stimulated top growth (12). Applications of this formulation alone or in conjunction with other chemicals might be useful, however, Gibberellic acid is expensive.

Other chemicals which have met with varying amounts of success are the arsenicals. There is no doubt that arsenic is detrimental to annual bluegrass, however, it also becomes quite clear that arsenic compounds that have been used are primarily lead arsenite, calcium arsenate, and sodium arsenite. Organic arsenic compounds have been introduced but have met with less success than the inorganic compounds.

The arsenics, when used for *Poa* control, have caused severe turf injury. Calcium arsenate and sodium arsenite have proven to be the worst offenders. The former was blamed for four weeks of poor growth in the month of May when it was applied in March. The grass in this case had a blue-gray color much like a frost burn (11). When this same compound was applied in the fall it caused severe winter injury (12). Experiments have shown that a small amount of calcium arsenate releases the activity of lead arsenate (12).

Re-establishment of grasses in areas where application of arsenics have been used is reported to be a problem on both bent and bluegrass (12, 15). Arsenic studies by Goss have shown that lead arsenate inhibits bent grass seed even to a greater degree than *Poa*. At rates up to 80 pounds per thousand square feet, *Poa* will actually germinate and mature (12).

Calcium arsenate has been recommended for greens, and if used, it should be applied three times: early spring, a month later, and early fall; totaling 16 pounds per thousand square feet. A 6 pound application the following year will maintain toxicity (23). Reseeding may be necessary after treatment if there are large areas of solid *Poa* (12).

Under cool conditions, such as those present in spring and fall seasons, 60 to 65°F, *Poa annua* is more subject to arsenic injury than creeping bent grass (2). The bents have been said to suffer more in hot weather, therefore, mid-summer applications of arsenic should be avoided.

Repeated applications of sodium arsenate spray at one pound per acre, prior to seeding and again during seeding, has been reported to make these seed sterile. Spraying should be done when the soil is wet and the grass is dry. Care should be used with this compound, since the higher rates will burn all species of grass (25).

Lead arsenate applied 5 pounds per thousand square feet, once a month, spring through fall, has provided many superintendents with fair to good control of *Poa annua*. This material must be applied for several years in succession. However, in all attempts to control annual blue with arsenicals, the use of phosphorus containing fertilizers must be avoided because phosphorus fertilizer applications and high phosphorus containing soils definitely make the arsenicals less toxic. This should be remembered if one

thinks he is getting arsenic injury. In this case, an application of superphosphate might do some good (1).

*Poa annua* will only invade areas when the permanent grasses are in poor health. Management practices conducive to permanent grass growth must be employed. All turf areas should be over-watered, height of cut should be governed by the requirement of the permanent grass species, control compaction on greens, tees, and heavy traffic areas. Provide good drainage wherever irrigation is used. Try to keep phosphorus low in the fertilization program. Use organic fertilizers in the spring and fall, and nitrate of soda or ammonium sulfate in the summer. Aerification should be done only in the spring — in the fall it helps seed the *Poa* without competition. Try to keep the pH close to 5.6.

Besides basic maintenance practices, superintendents should also experiment with preventative chemical measures. Try to maintain an arsenic toxicity in the soil by applying between 3 and 6 pounds per thousand square feet each fall, or as the new herbicides are marketed, try them on a limited area at different rates and times. When one seems to provide good control use it cautiously; a little *Poa* is better than 18 chemical burns.

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(Continued on Page 9)

## FUNGICIDE TRIALS FOR THE CONTROL OF TURF DISEASES INFECTING VELVET BENT-GRASS, MERION BLUEGRASS AND ANNUAL BLUEGRASS — CREEPING BENT MIXTURE

By

JOSEPH TROLL AND ROBERT HEALY  
 Department of Plant and Soil Sciences  
 University of Massachusetts

Fungicide trials for the control of turf diseases were conducted at three different areas within Massachusetts. Seven fungicides were compared for the control of *Helminthosporium-Curvularia* infecting a Vesper velvet bentgrass nursery on the Monson Golf Club. Four chemicals were evaluated for the control of *Fusarium* Blight infecting Merion bluegrass on a Hadley lawn. In a third trial, one fungicide, Daconil 2787, was tested for the control of Dollar Spot on the Amherst Golf Club putting green and the number nine green.

In test one, a section of the nursery was divided into 25 square foot plots. Each chemical was compared on four (5 ft. x 5 ft.) randomized plots. Applications were made to the nursery plots on July 20, 21, 28, and August 3 and 10, using a 2 gallon hand sprayer.

Fungicides, dosages and degree of disease control of the trial conducted on the nursery plots are listed in Table 1.

Table 1. Comparison of Fungicides for *Helminthosporium-Curvularia* Control on Vesper Velvet Bentgrass

Fungicide	1000 sq. ft. Dosage per	7/20	7/21	7/28	8/3	8/10
		Av. % Disease *				
Daconil 2787	1 oz	10	12	24	7	5
Daconil 2787	3 oz	6	5	6	2	2
Niagara	3 oz	4	8	—	—	—
Niagara	6 oz	3	4	—	—	—
Niagara	8 oz	5	—	—	—	—
Difolatan	3 oz	6	3	3	—	—
Difolatan	6 oz	7	9	4	—	—
TH	1 oz	3	8	9	4	2
TH	1½ oz	2	9	7	4	2
Tersan	3	1	2	1	3	2
Fore	4	2	2	1	1	2
Check	water	8	40	42	11	4

\* Figures based on average percent injured area of 4 replicated plots.

— Chemicals burned and applications were discontinued.

Both *Helminthosporium* and *Curvularia* spores were isolated from injured velvet bentgrass at the outset of the test. Two weeks after the spray program was initiated, *Fusarium* spores were also detected but disease symptoms were not typical, and, therefore, were discounted. The incidence of infection by *Helminthosporium* was low.

Tersan and Fore, each applied at the manufacturer's suggested rate, provided excellent control of the disease. Plots receiving Fore healed quickly and appeared to have the best color. It is possible that the minor elements in the fungicide might have promoted turf growth.

Daconil 2787, applied at the four ounce rate, gave good control without injury to the turf.

The fungicide listed as T.H., Table 1, appeared to give some control of the disease without injury. However, either amount of control or injury might have been increased if the manufacturer's suggested rate had been known and applied.

Both Niagara and Difolatan severely injured the velvet bent and their use was discontinued. Niagara caused a severe dieback of the grass tips. The injured grass took on a grayish cast. Difolatan, at the lower rate also injured the grass tips resulting in a slight discoloration of the plots. At the higher rate it caused a severe burning and thinning of the turf.

Test 2. Fungicides Difolatan, Fore, Niagara and Daconil 2787 were tested for their control of *Fusarium* Blight infecting Merion bluegrass. Each chemical was applied to 4 replications of 25 square foot plots. Applications were made every 14 days from mid-June on through to September, using a 2 gallon hand sprayer.

None of the chemicals controlled the blight. However, the incidence of disease in all treated plots remained the same for 28 days after the first treatment. Then there was an increase in the incidence of disease. Difolatan caused a very slight discoloration of the turf. A number of experiments, other than chemical control tests, involving *Fusarium* Blight, have been carried out. These results will soon be reported.

Test 3. Application rates of Daconil 2787 were compared for effective control of Dollar Spot at the Amherst Golf Club. The practice green and green nine, each consisting of a mixture of annual bluegrass and creeping bent, were divided into two. One half of each green received applications of Daconil on August 1, 15, 22 and 29 at the rate of 1 ounce per 1000 square feet. Four ounces per 1000 square feet were applied to the other half. The fungicide was applied with a power sprayer which delivered 3.5 gallons of solution per 1000 square feet at a pressure of 200 pounds.

Results indicated that the 4 ounce rate was decidedly more effective in controlling a Dollar Spot infection (Table 2). However, a change in the weather during the later part of August appeared to influence and lessen the incidence of Dollar Spot. Little infection was observed after August, and the disease was not observed again until the end of September and the first week of October. At that time, green five and the practice green became heavily infected. Because of the severity of the infection, only the 4 ounce rate was applied, and it furnished excellent control.

These results compare favorably with those of last year. Daconil, when applied at 4 ounces per 1000 square feet, gave a higher degree of control than at either a lower or higher rate. It is possible that Daconil should be used at 2 ounces per 1000 square feet in a preventative program, and at 4 ounces in a curative program.

Table 2. Comparison of Two Rates of Daconil for the Control of Dollar Spot on a Mixture of Creeping Bentgrass and Annual Bluegrass

Fungicide	1000 sq. ft. Dosage per	8/1	8/15	8/22	8/29
		Av. % Disease *			
Daconil 2787	1 oz	20	12	6	1
Daconil 2787	4 oz	11	5	2	0

\* Figures based on average percent injured area of 2 replications.

## POA ANNUA (Continued)

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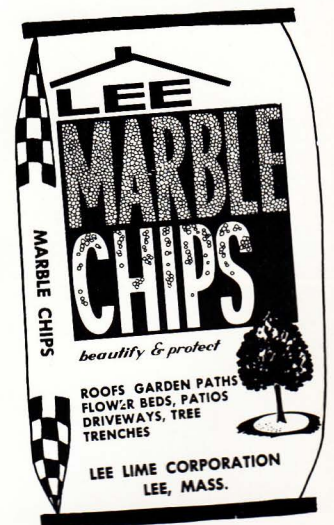
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# How To Repair a Ball Mark

## The Trouble With Ball Marks

The ball landed with a thud. The green was soft, and as the ball bounced forward it left a deep little crater in the turf, exposing brown earth at the back and grass blades pushed together at the front.

Ignoring the little crater, the golfer walked up to his ball, cleaned it, holed his putt and glowed with self-satisfaction.

Some hours later, after the exposed earth in the ball mark had dried out, another golfer found the damaged area in his line of putt. He attempted repairs, but the result was not very satisfactory. An unflattened bit of turf twisted his putt off line.

Next morning an inexperienced greenkeeper mowed the putting surface without repairing ball marks. The result was a putting surface

pocked-marked, untrue and covered with bare spots where the mower scalped the grass from the turf.

## What Happens

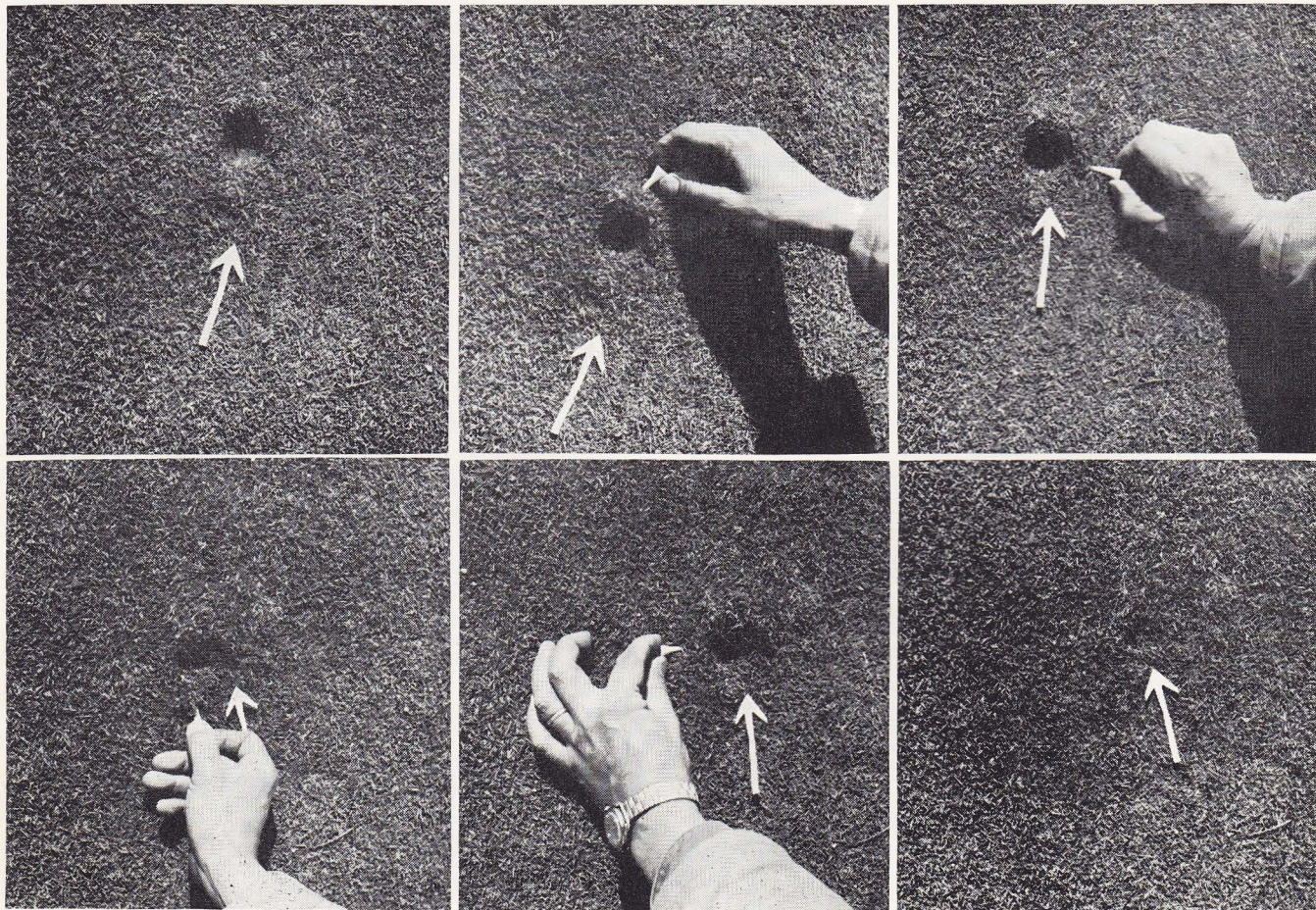
What actually happens when a ball mark is not promptly and properly repaired?

1. Soil is exposed, and so the area immediately surrounding the ball dries up faster than it would if the ball marks were repaired; and thus a blemish is left on the green.

2. There is a chance that the raised turf caused by the ball will dry quickly and may die out.

3. The open soil invites weed invasion, such as crabgrass, silver crabgrass, POA ANNUA, dandelion, plantain, or Pearlwort . . . seed of which could be brought in on the shoes of

*The first photograph below shows the damage caused by a ball hitting into a green. To repair the ball mark, a probe, most often a wooden tee, is inserted into the ground at points all around the mark, the soil loosened and the turf stretched over the depression. Then the soil is pressed down and made smooth. The final picture shows the result of a properly repaired ball mark.*



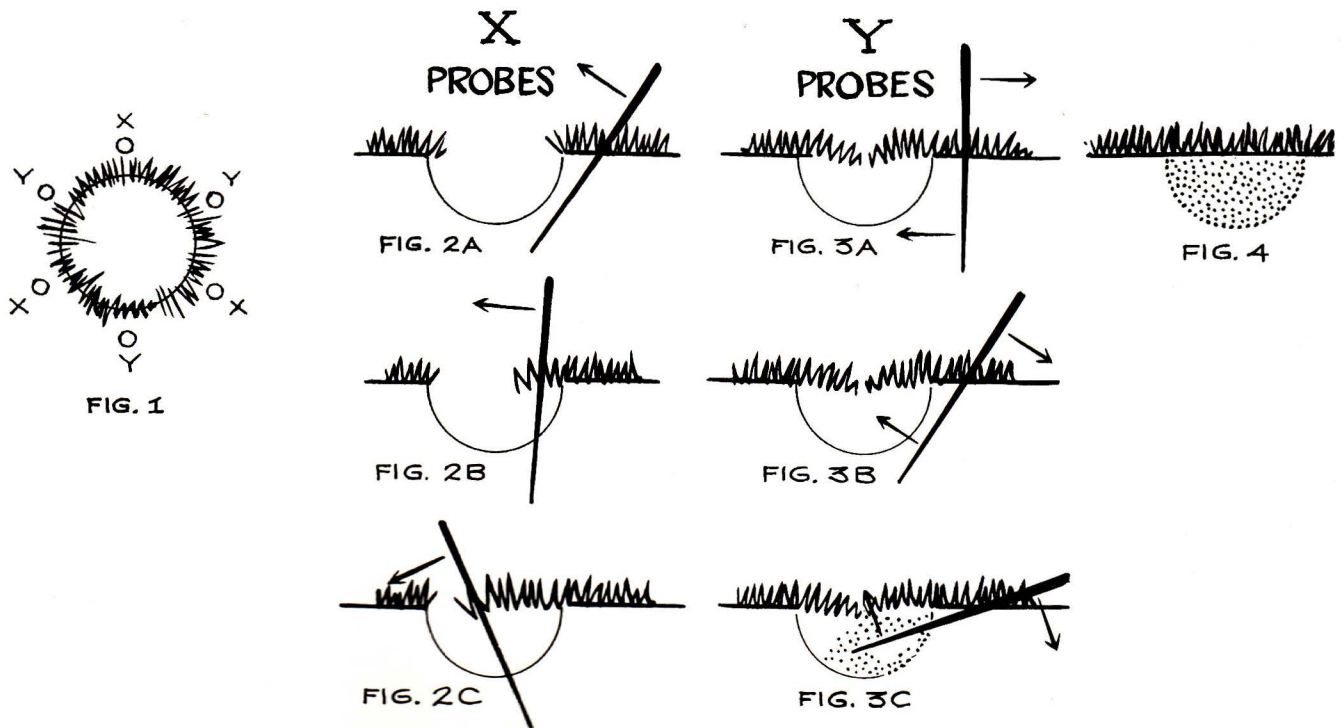


Figure 1: X marks, indicate probe penetration to stretch turf over ball mark. Y. marks indicate probe penetration to loosen and raise soil. Figure 4 is result.

Figures 2a, b, c: To stretch bruised turf: Place instrument into soil at about 45-degree angle,  $\frac{1}{2}$  inch outside perimeter, and stretch turf over ball mark by moving instrument in and down.

Figures 3a, b, c: To loosen soil: Place instrument vertically into soil about  $\frac{1}{2}$  inch outside perimeter, and press instrument out and down.

Thereafter, firm the turf with putter, palm of hand or shoe (except that on the line of putt you may not step on the damaged area).

golfers, caddies or workers or on mowing equipment.

4. The improperly repaired or neglected ball mark leaves a bumpy spot in the green. If not corrected before cutting the next day, then the spot is scalped by the mower and the bruise mark remains for several days. This is especially noticeable in the Northeast during the summer season.

William H. Bengeyfield, Western Director of the Green Section, says:

"From an agronomic viewpoint, a ball mark bruises the grass plant and severely damages or destroys the meristem or growing point. This means that turf recovery must take place from the perimeter of the damaged area, and this takes considerable time. Rapid drying of the damaged area is a major factor in delaying recovery. Some soil compaction also results from the ball's impact."

#### How To Make Repairs

There is a correct way to repair a ball mark and, simply stated, it is to stretch the turf back over the bruised area, then loosen the soil beneath so that the bruised turf is able to root again.

To loosen the soil, some sharp-pointed instrument is required, such as a golf tee. The instrument must be sharp enough to penetrate the soil easily, and strong enough to cut through soil laterally at a depth of one inch or less.

In stretching the turf back over the ball mark area, try not to tear it loose. After the soil is loosened, the bruised and stretched turf must be firmed or pressed down to make contact with the soil again; otherwise, it may dry and die.

If a divot is taken when the ball hits the green and skids, the divot must be carefully stretched and replaced.

## New England Scholarship



"Norman F. Bartlett, Turf Management Student at the Stockbridge School of Agriculture, University of Massachusetts, receives the LAWRENCE S. DICKINSON Scholarship from the Golf Course Superintendents' Association of New England. Presenting the award are, from left to right: Leon St. Pierre, (president) Mr. Bartlett, PHIL CASSIDY (chairman of scholarship committee) and Dr. Joseph Troll."

The Golf Course Superintendents' Association of New England was initiated in 1924 to elevate the standards of the profession and to inspire a closer bond of its members.

The club, the first of its kind in the United States, has introduced or sponsored several educational programs since its formation, some of which are:

Close cooperation with the Winter School for Turf Managers at the University of Massachusetts.

Sponsor of the Massachusetts Turf Conference and the Golf section of the annual Recreation Conference at the University of Massachusetts.

Financial support for experimental work at the University of Massachusetts and Rhode Island Experimental Station.

A night school so that members, who are unable to avail themselves of the many short courses being given at State Universities, may have the

benefits of the latest information on turf culture and course maintenance.

At a recent meeting, Norman F. Bartlett became the first recipient of the New England Superintendents' most recent educational award.

The scholarship, which is to be presented annually to a student of Turf Management, was formed in honor of the late Lawrence S. Dickinson, Professor Emeritus at the University of Massachusetts.

A pioneer in the teaching of turf management, Professor Dickinson initiated the Stockbridge Winter School and the two year school for Turf Management after visualizing the need for trained men to serve as golf course superintendents.

Since 1927, as a direct result of Professor Dickinson's vision, more than 500 technologists in fine turf management have been graduated from the Stockbridge School.

The second U.S.G.A. Green Section Award was presented to Mr. Dickinson in 1962.

# 1967 Turf Conference

MARCH 9 and 10, 1967

Student Union  
University of Massachusetts  
Amherst

THURSDAY, MARCH 9

— Morning —

9:30-10:00 **Registration and Informal Coffee Hour**  
— Colonial Lounge

BALLROOM

## COMBINED SESSION

Chairman: Leon St. Pierre, President  
Golf Course Superintendents Association of  
New England

- 10:15 **Welcome**  
— J. Richard Beattie  
Associate Director, Extension Service  
University of Massachusetts
- 10:30 **Winter Injury and Prevention**  
— Dr. James B. Beard  
Michigan State University
- 11:15 **The Nature of Soil Acidity and Liming**  
— Dr. Fred E. Hutchinson  
University of Maine
- 12:00 **Lunch — Ballroom**

THURSDAY, MARCH 9

— Afternoon —

BALLROOM

## COMBINED SESSION

Chairman: Leon St. Pierre

- 1:45 **History of *Poa Annua***  
— Dr. John C. Harper II  
Pennsylvania State University
- 1:45 **Recent Developments, Maintenance Practices  
and Control of *Poa Annua***  
— Alexander M. Radko, Director  
USGA, Green Section
- Panel**  
— Joseph R. Flaherty, Asst. Superintendent  
Baltusrol Golf Club, Springfield, N. J.  
— Lee Record, Agronomist  
USGA, Green Section  
— Charles H. Tadge, Superintendent  
Mayfield Country Club, South Euclid, Ohio  
— Al Caravella, Superintendent  
Colonia Country Club, Colonia, N. J.
- 4:00 **Massachusetts Turf and Lawn Grass Council  
Business Meeting — Middlesex Room**

## ALTERNATE AFTERNOON SESSION

Those not interested in golf course maintenance can  
attend the alternate session on general turf manage-  
ment.

— Afternoon —

MIDDLESEX ROOM

## ALTERNATE SESSION

- Chairman: George Moore, President  
Massachusetts Turf and Lawn Grass Council
- 1:15 **Growing and Distribution of Sod**  
— Benjamin Warren  
Warren's Turf Nursery
- 2:00 **Post Management of Sod**  
— George Stewart  
Karandrew Turf Farms
- 2:45 **Sod Certification**  
— Dr. Henry W. Indyk  
Rutgers University
- 3:15 **Management of Various Park and Turf  
Gardens**  
— Robert W. Sharkey  
Superintendent of Parks  
Attleboro, Mass.

— Evening —

Chairman: Dr. Joseph Troll  
University of Massachusetts

- 6:30 **Banquet**  
— Coachlight Room  
Hotel Northampton, Northampton  
**Speaker — Professor Jack Denison**  
University of Massachusetts  
**"Recreation vs. Agricultural Production"**

FRIDAY, MARCH 10

— Morning —

BALLROOM

## COMBINED SESSION

Chairman: Leon St. Pierre

- 9:15 **Performance: "USGA Greens," After Eight  
Years**  
— James L. Holmes  
Mid-Western Agronomist, USGA
- 10:00 **Soil Modification and Results of Further  
Testing**  
— Dr. Donald V. Waddington  
Pennsylvania State University
- 10:50 **Water in the Right Amount, in the Right...  
Place, at the Right Time for Turf**  
— Dr. Eliot C. Roberts  
Iowa State University
- 11:30 **That's Not What I Said!**  
— Frank Gallagher  
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**Adjourn.**

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# Marketing Of Turf-Grass Sod

by EDWARD C. HORTON

*Stockbridge, University of Massachusetts*

Like the total turf-grass industry, it is difficult to estimate just how big the sod business has become. It was started prior to World War II, chiefly with farmers who could increase their income by cutting sod from a cow pasture. Sales were only periodical, prices insignificant and quality was hardly a factor. Buyers included occasionally a highway contractor for erosion control on slopes, a landscape contractor, an estate, a professional ball park or some specialized project such as the 1939 New York World's Fair.

In a few cases, better quality was required. Golf course superintendents began to cultivate sod areas to replace exhausted tees and damaged greens. Features were specially groomed and an occasional field of grass was planted. From these small beginnings emerged the present concept of sod-growing. Following World War II, the real development of today's sod industry was triggered by the national housing boom, the rapid expansion of industrial plants, and the rising standard of living. Farsighted sod producers began to lease acres of pasture land near growing metropolitan areas. Now, although unprofessional in its beginnings, sod production is among the most highly specialized of modern agricultural businesses. Expansion has been the theme and mechanization the principle.

As a consequence of our society's growing competence in producing an abundance of goods and the tendency toward over-production, companies are concerned with the task of balancing the supply with the demand by controlling or influencing the amount produced and the amount consumed, especially the latter. Marketing, "the business activities involved in the flow of goods and services from the point of initial production until they reach the ultimate consumer" is the system which has been devised by the producers to increase consumption.

To the sod-producer "marketing" has now become the by-word. Thus, marketing divisions with closely defined tasks have evolved to move the productive capacity into the hands of the consumer. The main problem encountered in the sod market is to locate potential buyers and to secure orders which the company can handle profitably. Two-way communication must be carried on with these buyers in order to best fit the product and the method of its distribution to the desires of the consumer. A further responsibility of the marketing division is to standardize the company's prices and to define the terms of a sale.

Turf-grass Times listed the many specialized facilities comprising the sod market:

1. Athletic Fields — Professional, Collegiate, Secondary
2. Airports
3. Cemeteries and Memorial Parks

4. Churches
5. College and University Grounds
6. Golf Courses and Tennis Courts
7. Highway Rights-of-Way
8. Lawns — Residential, Commercial
9. Parks — Municipal, State, Federal
10. Schools — Public
11. Lawn and Landscaping Service Companies
12. Seed and Sod Producers
13. Lawn and Garden Centers
14. Home Owners

The production and management of all of these facilities rely directly or indirectly on the utilization of special purpose grasses for utility, beautification, or recreation.

There are three major approaches to the analysis of sod marketing problems — the functional approach, the institutional approach, and the commodity approach. All three are merely ways of breaking down a complex marketing problem into its parts so that it can be better understood. In the functional approach the marketing processes are broken down into functions. A marketing function may be defined as a major specialized activity and performed in accomplishing the marketing processes of concentration, equalization, and dispersion. The functional approach considers the jobs which must be done, whereas the institutional approach to marketing problems focuses attention on the "who". This approach considers the nature and character of the various middlemen and related agencies and also the arrangement and organization of the marketing machinery. In the final method, the commodity approach, attention is focused on the differences in marketing which arise because of differences in either the commodity or its production. Perishability, seasonality, and the size of the basic production unit may influence the way functions are performed and the type and organization of institutions which perform them.

The approach used in this paper to analyse sod marketing is mixed — partly functional, partly institutional, and partly by considering the commodity alone. Undoubtedly, however, the institutional approach has been favored.

Eight groups of people are usually employed to complete the make-up of an efficient sod marketing division:

I. **Salesforce:** The company's salesmen normally play a key role in discovering customers and winning their patronage. To accomplish this, some or most of the following duties must be carried out: check customer's stock and write up orders for re-

placement; arrange displays; adjust complaints about defective goods or errors in shipping or billing; explain the advantages (or disadvantages?) of the company's new products; and accumulate information about competitors' new moves, their prices and the success of their products.

What are the requirements for a high degree of salesmanship? The following list indicates some of the more important attributes which a salesman must acquire before he will be successful:

1. A thorough knowledge of his product and his customers' businesses.
2. An outgoing but "down to earth" personality.
3. A perception of what is fit.
4. Enthusiasm and pride of profession.
5. Confidence in his ability.
6. Good personal habits with respect to dress, punctuality, integrity, honesty and dependability.

To supplement their research, advertising and public relations program, Warren's Turf Nursery of Palos Park, Illinois, maintains a staff of skilled salesmen, trained in lawn maintenance and care. These men serve not only as salesmen — they act also as "trouble shooters" when a Warren dealer has a lawn problem. As a result of improved sales techniques, Mr. Don D. Juchartz, Agricultural Extension Director for Wayne County, Michigan, estimates that the replacement and maintenance cost of turf grass sod in Metropolitan Detroit area alone is now approximately \$250,000,000 annually.

**II. Outlets:** The company's outlets are the middlemen of the channels of distribution through which the products move. Outlets such as landscape gardeners and lawn or garden centers may be privately or company owned. Mr. Gene Johanningsmeir, of Hiram F. Godwin and Son — Detroit area turf and sod producer — indicates that Michigan exports about 70% of its sod (approximately 30,000 acres) to surrounding states. Many large producers, he says, are opening small branch nurseries or outlets, across the midwest to meet this demand. In 1963, the Florida State Department of Agriculture published a booklet which reported that 52,000 new Florida homes were landscaped each year by sod producer outlets and that the combined yearly expenditure in Florida for lawns, landscape material, supplies and services exceeds \$330,000,000.

For one-third of a century it has been Warren's Turf Nursery's policy to market sod only through the landscape contractor or garden supply dealer, never direct to the home owner and never through cut-rate discounters. The landscaper or garden dealer need have no fear that his customer will be quoted a price at or near his cost. This policy is strictly enforced at their nurseries and sales yards. Warren Turf Farm has nurseries in Chicago, New York, Indianapolis, Milwaukee, Denver, and distributors in Kansas City, Cleveland, and Weston, Massachusetts.

Summit Hall Turf Farm, Gaithersburg, Maryland, sells to three distinct markets: do-it-yourself homeowners; custom installers; and wholesale buyers. The do-it-yourself market is reached by a heavily promoted pre-season sale between the first week in March and the middle of April. After that, plug sales are handled by the Hechinger Company, a local chain-operated haven for all kinds of do-it-yourself products. Hechinger's handle both zoysia plugs and Meri-

on bluegrass sod. Plugs have been in the stores regularly for the past several years, but sod was tried on an experimental basis only two years ago. It turned out to be an instant success, particularly attractive to the homeowner who needed just a few yards for repair work. Summit Hall stocks the chain's eight Washington area stores on consignment every Thursday and picks up unsold material the following Tuesday. Returns are sold at reduced prices to a waiting list of customers who have registered their names with the Farm. Generally, there is little or no return of material during the height of the spring planting season except for an occasional weekend of inclement weather. In that case, the Farm's office staff starts telephoning the waiting list and within a few hours everything is gone.

Outside the Washington area, Summit Hall conducts a large scale mail-order business for zoysia plugs. Promoting their plugs through the garden pages of metropolitan daily newspapers brings orders in from every corner of the country. During the most active season between March and June, the Farm harvests, packs and ships on an assembly line basis. Local housewives are used to help out in the packing shed, processing the several million plugs sold each season.

**III. The Advertising Department:** A sod marketing division usually includes a group of men and women who handle advertizing, which is defined as "the communication to potential users the wanted consequences of buying a company's product." Promotion-minded sod men are merchandising their products through professionals such as landscape architects and golf course superintendents and by newspaper and magazine advertizing. Some sod men hold special field day programs for consumers, and some exhibit in state, regional, and national shows. Warren Turf Nursery, out of Chicago, promotes "backyard putting greens" through the Wall Street Journal advertizing. They claim that "seeding is old-fashioned, inefficient and dirty, it is the horse-and-buggy way of making a lawn. Sodding is quick, clean, efficient and modern. It is the 20th Century way of making a lawn. It is modern living." Cal-Turf Nursery in California sells the advantage of "instant lawns" over the weedy sprig method. Karandrew Farms, Inc. of Suffield, Connecticut, makes a fetish of on-time delivery, claiming that if sod is not delivered when promised, that sod will cost no more money than the amount shown on the invoice.

Summit Hall Turf Farms in Gaithersburg, Maryland, uses an advertising agency and attractive full color sales brochures. William H. Wilmot, Manager of the Summit Farms, indicates that they spend nearly 15% of the gross income on promoting the sale of sod. He listed as promotion such things as letterheads, uniformed workmen, clean trucks, direct mail campaigns, as well as paid advertising campaigns.

"Shipped anywhere on the North American Continent within forty-eight hours" is one of the promises advertised nationally by Warren's Turf Nursery of Palos Park, Illinois. In addition to company placed ads, Warren's Turf Nursery pays for 50% of the ads placed by Warren dealers who qualify for this advertising allowance.

**IV. The Product Development Department:** A fourth group, responsible for conceiving and perfecting new products and improving the characteristics

of older products, has in recent years become increasingly important as a selling arm. California Turf-Grass Nurseries, Inc. has developed its own research plots. Tests include studies on growth and adaptability to determine which turf-grasses are best suited to California's needs; wear and compaction, planting methods, soil amendments, and maintenance practices. Warren Turf Nursery has established their own research organization with field and greenhouse studies. A considerable amount of their research budget goes into selection and evaluation work of turf species. This effort has produced some worthwhile improvements and presently the nursery has a patent pending for an improved bluegrass variety.

The sod industry's greatest need is for improved disease resistant turf-grasses, for, as Dr. C. Reed Funk of Rutgers University told more than 100 turf specialists who toured Princeton's Turf Farm's Croshaw Farm, Hightstown, N. J., "The sod industry is in danger of becoming a one-variety industry in the Northeast."

Since competition between sod producers will increase, profits will be dependent upon the availability of superior products. Thus improved varieties and strains of the special purpose turf grasses must be conceived by future sod producers. This will contribute immeasurably to the total turf-grass industry.

Effective standardization is basic to an efficient pricing process. It is, therefore, one of the activities which makes possible mass selling, which is so important to the economy of the sod producer. But "growing pains" has currently beset the sod industry in many parts of the country. These relate more to business practicalities than to technical know-how, but nonetheless sod quality is highly erratic. In time demands of the marketplace will cause shake-out of itinerant, less responsible producers. Meanwhile, sod buyers should be made more alert to quality features and advantages. Some states, notably Florida and New Jersey, now certify sod. A consumer unsure of his source, can ask for this attestation of quality.

**V. The Marketing Research Department:** The fifth marketing group handles marketing research and economic studies. Its main task is to prepare studies which will help the other marketing groups to find customers and to spend their dollars wisely — that is, to increase sales and reduce marketing costs. The group furnishes market information useful in making decisions about market procedures, product improvements and sales forecasting. Standards such as quotas for geographical sales districts are established and estimates on how much money should be spent on salaries, travelling expenses, catalogues, etc., are made. Advertising and research programs are evaluated and the concept of reallocation of the least productive dollars spent is recommended. The group probes for information about the market's probable reaction to new grass varieties, and by becoming familiar with the consumers' goals, proposes the best means of achieving those goals.

Sod growers are urged to adopt a uniform contract for sod sales. Such a contract, according to Edward F. Mayne, owner of Mayne Realty Company, Olney, Maryland, should include a description and location of the sod, the price, terms of payment, and the time of removal and delivery of the sod. This

type of contract, he added, would protect both the producer and the user of the sod.

The marketing research department is usually responsible for pricing, and decisions affected by costs of labor, materials and other variables must be taken into consideration. The heart of price formation under competition is the supply-and-demand analysis. Changes in demand and supply have their real importance in their effect on the equilibrium price.

There is no end to the material which the Marketing Division must be familiar with. Organizational features such as the tendency toward integration should be examined at this point. Integration is the process whereby sod companies expand by grouping together under one management additional agencies or functions. Mercer Sod, Inc., Springfield Township, New Jersey, started as an offshoot of the Mercer Contracting Co., landscape contractors. Much of the sod produced goes into Mercer's landscaping jobs. Such capability for covering the entire field of landscaping enables them to take on more work, and makes them more adaptable for all phases from layout to follow-through than the split operators.

Efficient marketing cannot operate in an information vacuum. Most of this function is performed by those who specialize in its performance — the market research department. On the other hand, everyone in the marketing structure who buys and sells products evaluates available market data and therefore performs this function to some degree.

**VI. The Shipping Department:** Briefly, the task of the sixth group is to make sure the customers receive products promptly and in good condition. Sod producers are rapidly progressing toward mechanization in this phase. Ousley Sod Company, Pompano Beach, Florida, illustrates this. Fork-lift trucks, dispensable cardboard pallets, new sod harvesters, conveyors for loading and tandem trucks equipped with boomtype loaders costing in excess of \$17,000 are versatile and practical answers to fully mechanizing sod handling and delivery. These all result in better service to the customer.

Transportation of turf-grass sod is a problem of prime consideration. Sod is a bulky product but is considered to have a short "shelf life". Sod cannot be safely stocked in rolls longer than a few hours. This is especially true in warm, humid weather. At the peak of the selling season — late May to early June — when grass is seeding, seems to be the most critical period, as it is at this period that sod heats or ferments fastest. The only way sod can be safely shipped or loaded for more than 24 hours is to ice it before rolling and loading, or by vacuum cooling to about 33°. Both operations are expensive, costing about ten cents per square yard. Vacuum cooling is much cleaner, eliminating excessive moisture; but you will find few such coolers in operation near sod fields. Presently there are three coolers in the U.S. Since the cost of these units is about a quarter of a million dollars, there must be a tremendous potential sod volume before such a building can be considered.

Similarly, storage of turf-grass sod at the market outlets is a severe headache. The suppliers are advised not to stock more sod than they can move in 24 hours unless they are prepared to lay the sod out and water it. As closely as Warren Turf Nurs-

# Nematocide Tests On Established Lawn Turf

By JOSEPH TROLL AND RICHARD A. ROHDE

*Departments of Plant and Soil Sciences  
and Pathology - Entomology  
University of Massachusetts*

Three experimental and one nematocide previously tested elsewhere were compared for the control of turf nematodes and their effect on a grass stand.

An area of campus turf, consisting of a mixture of Kentucky bluegrass and creeping bentgrass interspersed with clover and a small amount of other weeds, was divided into 25 square foot plots. The turf area was mowed to 1½ inches, then aerified. Grass clippings and turf plugs were raked off.

Each nematocide was thoroughly mixed in 2 gallons of water and applied by hand with watering cans to four (5ft. x 5 ft.) randomized plots within the area. The plots were then watered for 24 hours with a sprinkler having an outlet pressure of 50 pounds per square inch.

The turfgrass area was not mowed for one month after treatment but did receive a complete fertilizer, 10-6-4, at the rate of one pound of actual nitrogen per 1000 square feet.

One month after chemical application, a grass catcher was attached to a 20-inch reel-type mower, and clippings from two cutting passes in each treatment site were collected weekly for 4 weeks.

Approximately 2½ weeks after application of the chemical, each plot was examined for nematodes. Soil samples were taken at random from each plot with a soil probe and then mixed. Nematodes were extracted from a 100-gram aliquot of soil from each plot by the sugar flotation method and were then counted. All parasitic nematodes were identified as to genera. Results of the trial are shown in Table 1.

The materials used were furnished by courtesy of the following companies: "TH 285-N", Thompson-Hayward Chemical Co., Kansas City, Missouri; "Mocap", Mobil Chemical Co., Ashland, Virginia; "NIA 10242", Niagara Chemical Division, Middleport, New York; and "Sarolex", supplied by Geigy Agricultural Chemicals, Ardsley, New York.

Table 1. Average number of parasitic nematodes recovered from the soil, and the average clipping weights of a Kentucky bluegrass-creeping bentgrass mixture treated with nematocides.

Nematocide	Rate of Application	No Nematodes	Avg.
			Clipping wts. four cuttings (in grams)
TH-285-N	90 lbs/A	33	47.0
TH-285-N	180 lbs/A	37	46.1
Mocap	25 lbs/A	33	48.2
NIA 10242	20 lbs/A	125	44.1
Sarolex	1½ pts/1000² ft.	4	38.7
Sarolex	2½ pts/1000² ft.	8	41.3
Control	Water	171	47.1

Data are means of four replications

Both rates of TH-285-N improved the color of the turf 3 days after application. The chemical formulation of TH-285-N was not known but it is possible that it contains a fertilizer element, such as nitrogen, which would account for the improved turf color.

Nematodes belonging to the genera *Tylenchorhynchus*, *Criconemoides* and *Xiphinema* were recovered but only *Tylenchorhynchus* was found distributed rather evenly over all treated areas.

All data were not analyzed statistically. However, results appear to indicate that all the nematocides except NIA 10242 significantly reduced the number of parasitic nematodes compared to the control. Sarolex-treated plots yielded the lowest number of parasites. However, a reduction of parasitic nematodes by the nematocides did not necessarily increase turf clipping weights. Clipping weights from Sarolex-treated plots were slightly less than those harvested from the other treatments. The results indicated that stimulation of grass growth was not entirely related to a reduction in parasitic nematodes.

## MARKETING TURF-GRASS (Continued)

eries has been able to estimate, the cost to unroll, water, then roll up and place a yard of sod in a customer's car is about 10 cents per yard. This figure, of course, could go much higher in the event the sod is not moved quickly and must be maintained for any length of time. If space is available, sod can be held for long periods on polyethylene tarps or a pavement, provided it is watered daily and is fertilized occasionally.

VII. The Record Keeping Department: The seventh group is the men and women in the offices who check the credit standing of unknown buyers, prepares shipping orders and invoices of sales and stock on hand. Their task is mainly to see that the customers' invoices and the company's accounts receivable records are handled accurately and promptly.

Collections of accounts receivable is a problem that almost every sod grower has a burning interest in. There are several reasons accounting for this problem. One, sod is a product that has no retrievable value after the customer has received it. Two, a large percentage of sod is sold to landscape contractors, and unfortunately a relatively large percentage of landscapers are either underfinanced or poor businessmen, or both. Three, these landscapers require relatively large amounts of short-term credit to finance their projects. This credit is usually extended by their suppliers since it is difficult for them to obtain through banks.

(Continued on Page 26)

# Turf Renovation And Management Of The Ohio State University Football Stadium

S. R. ANDERSON, K. L. BADER, R. GUARASCI,  
A. E. HOFFMAN AND R. W. MILLER\*

There has been increased interest in the past few years concerning turf renovation programs for athletic fields. Probably few turf areas receive as much concentrated traffic in such short periods of time as do football fields. This heavy use often results in marked deterioration of the turf. The subsequent useability for play, as well as the aesthetic value, is adversely affected.

Turfgrass experts and athletic field managers have shifted their attention toward the possible use of a more highly wear resistant grass. The realization that turf grasses do differ as to their persistence under traffic has given to renovation problems of establishing and maintaining these grasses on athletic fields.

The Ohio State University Athletic Department, in 1961, decided that such a renovation program was necessary for its football field. Numerous consultations were made with qualified personnel throughout Ohio and other states before the program was initiated. The program used has been considered successful. It is the objective of this article to outline some of the procedures followed so that the turf in high school athletic fields and other turf areas receiving heavy traffic can be renovated and/or managed in such a way so that the turf will persist in good condition under the type of play or wear it receives. It should be emphasized that all phases of our program may not be practical for everyone to follow. Drainage, for example, may already be adequate. Possible limitations of labor and finances may restrict the use of certain phases of this program. There are, however, important criteria and considerations that can be given which will enhance the success of any turf renovation and maintenance program for athletic fields or playground areas.

Ohio Stadium turf, during the 1961 football season, consisted of a poor common Kentucky bluegrass sod which was heavily infested with bentgrass, yellow nutsedge, and various other obnoxious weeds. It was decided that a complete renovation program was necessary. Plans were formulated before the end of the 1961 football season.

Since a poor grade of sod existed in the field it was decided that all vegetation should be removed by the use of a sod cutter after the last game on November 18, 1961. This was followed by the establishment of a new set of drainage lines over the field. In this instance, four-inch tile lines were laid longitudinal at a distance of twenty feet apart. The tile were placed at an eighteen-inch depth. Eight inches of pea gravel was backfilled over the tile lines before filling. Grade was established from the center of the field toward each and where it was connected with a six-inch line running crosswise over the field. Soil conditions and the effectiveness of drainage systems already present in your field should dictate the neces-

sity of establishing a new drainage system. It is very important that some artificial drainage be provided so as to remove excess water from the soil as quickly as possible.

Soil samples were collected from various locations on the field and sent to the Soil Testing Laboratory for routine chemical analysis. This should be one of the initial steps taken in any turf renovation program as fertilizer and lime need to be applied according to the needs of the soil and turf.

After the tile trenches were backfilled, 500 lb./A of 12-12-12 fertilizer was applied in accordance with the soil tests and known turf requirements. Twenty tons of fired clay aggregate (calcined clay) was then spread evenly over the field. The area then was plowed to an approximate depth of eight inches. Twenty additional tons of fired clay was added prior to plowing in the opposite direction at a depth of four inches. Several diskings then served to smooth the field. The addition of calcined clay was made to increase and maintain the permeability of the soil, particularly under traffic. The material was incorporated throughout the upper eight inches of the soil profile and, as will be related later, again was well distributed in the upper two inches.

After the aforementioned steps, the soil was fumigated to destroy the perennial weed seed and plant remnants remaining after the sod removal. The important criteria to remember at this point is that most fumigants are not active at soil temperatures lower than 45°F. A wide variety of fumigants are available so careful selection must be made if this step is to be followed. Fumigation in the late autumn is preferred when this turf renovation program is incorporated into the regular football program, due to the fact that early spring seeding is essential, if the seeding, rather than sodding, program is to be used.

Fumigation was completed by the end of the first week in December. The soil was covered with a canvas for a period of six weeks to improve the activity of the fumigant. After this interim period the soil was left exposed over the winter period to settle. It was decided to seed rather than sod due to the fact that sod of the type and quality desired was unavailable. Ninety percent Kentucky 31 tall fescue (by seed count) and 10% Kentucky bluegrass was to be seeded. This percentage was based on approximate seed numbers since the seed size of these two turf species are considerably different. Delta, Newport, and Merion varieties of Kentucky bluegrass were selected and mixed equally. A seeding rate of

\* Professor of Agronomy, Assistant Professor of Agronomy, Ohio State Stadium Superintendent, Ohio State Golf Course Superintendent, and Assistant Professor of Agronomy, respectively.

nine pounds of tall fescue and one-fourth pound Kentucky bluegrass mixture per 1,000 square feet was to be used. Clean, weed-free straw was procured and stored for future mulching purposes.

With the first break of spring weather the field area was worked with a field cultivator to loosen the soil. Twenty additional tons of calcined clay and four hundred pounds per acre of 13-13-13 fertilizer was applied. Light cultivation preceded the final establishment of grade and seedbed. Grading in some areas had to be accomplished by hand tools. The field was graded with an 18-inch crown sloping away to each end and side to provide surface drainage.

The tall fescue and Kentucky bluegrass mixture were seeded separately in early April. The seeding was made in two directions. A light straw mulch was applied after the seed was lightly raked into the seedbed. The straw and seedbed was kept moist until germination and growth of the seed occurred.

This seed mixture, particularly tall fescue, exhibited considerable seeding vigor. Regular mowing and irrigation became an integral part of the program. The turf was maintained by mowing at approximately  $2\frac{3}{4}$  inches. It was felt that high mowing during the summer was essential to favor the vegetative development of tall fescue. Frequent mowings were essential so that no more than one inch of clippings were removed at one time. Approximately two inches of water was applied at seven to ten day intervals, depending on the natural precipitation. Good sod cover was present by June 8, the time of spring graduation.

The summer program consisted primarily of mowing and irrigation. The field was fenced so that all traffic was kept off. One and one-half pounds of nitrogen per thousand square feet was applied the first week of July. A mixture of one-fourth pound of 2,4-D and three-fourths pound of 2,4,5-TP per acre rate was sprayed over the area July 10. This herbicide was applied to selectively kill the white clover present in the turf. Due to the fact that the grass was extremely succulent, fungicide (Parzate) was applied at two-week intervals to maintain disease-free turf.

As the first football scrimmage neared (September 22), the cutting height was gradually reduced to two inches. At this point it became necessary to use a tarpaulin to cover the field before and after games to prevent rain from interfering with the optimum soil moisture condition for playing. This was one of the *important* phases of maintaining this or any other turf under concentrated traffic. No grass will stand up under play (particularly the seedling year) if adequate means are not available for regulating the soil moisture. Five of the six home games during the 1962 season were either preceded by heavy rain or it rained during the game. The success of this program had to be due, in part, to the fact that the field was covered and soil moisture was below field capacity before the start of most games.

Preceding the last two games, tall fescue was overseeded in the existing turf. Subsequent football play resulted in "cleating in" of the seed. A little of this seed did germinate and contribute somewhat to the appearance and density of the sod. After the last game, November 23, the turf area was aerified, overseeded with tall fescue seed, and lightly top-

dressed with a calcined-clay soil mixture. The turf was maintained through six games and two practice scrimmages under some of the most adverse weather conditions possible. However, nearly all the tall fescue disappeared during the following winter. It was felt that this resulted from winter-killing enhanced by late fertilization to maintain growth and color along with close clipping for desirable play.

The "cleat" seeded fescue came through the following season again resulting in high quality turf. The late fall seeded fescue germinated in mid-March giving more maturity to the turf the second year than if it had been spring seeded.

Similar fertilizer, herbicide and fungicide treatment have been pursued each year or as deemed necessary by careful management, observation and testing.

### Some Pertinent Observations

During the first (1962) playing season tall fescue predominated the turf. Careful analysis indicated 80 percent or more of the turf was tall fescue. Possible player damage and the aforementioned winter injury apparently caused the fescue to be largely eliminated. Even though "cleat" seeding was successful in "bringing back" an excellent turf, the tall fescue contributed considerably less during the 1963 season. Less than 25% of the turf was tall fescue during 1963. The Kentucky bluegrass strains more than adequately filled the gap. A predominance of the Merion strain appeared to exist.

As of this printing, the field is nearly 100 percent Kentucky bluegrass (and largely Merion) even though the same fall program was used where tall fescue was "cleated in" by football play.

The availability of a canvas to keep rain off the field and thereby maintain optimum soil moisture for play, the right seeding mixture, and a conscientious, well schooled, cooperative groundskeeper are three of the most important criteria in playground, park, or athletic field turf renovation and maintenance. A constant check on all phases of turf growth and management is essential at all times and at regular intervals. Turf maintained under a high degree of management for heavy wear requires special attention of properly trained individuals.

One of the more important phases of a renovation program of this type is to realize that no turf on a football field is going to go unscathed under play. It is imperative that an identical sod nursery be established to provide sod for the field areas that receive particularly heavy damage. A proper maintenance program of fertilizing, mowing, and insect and disease control is necessary for both the nursery and field area.

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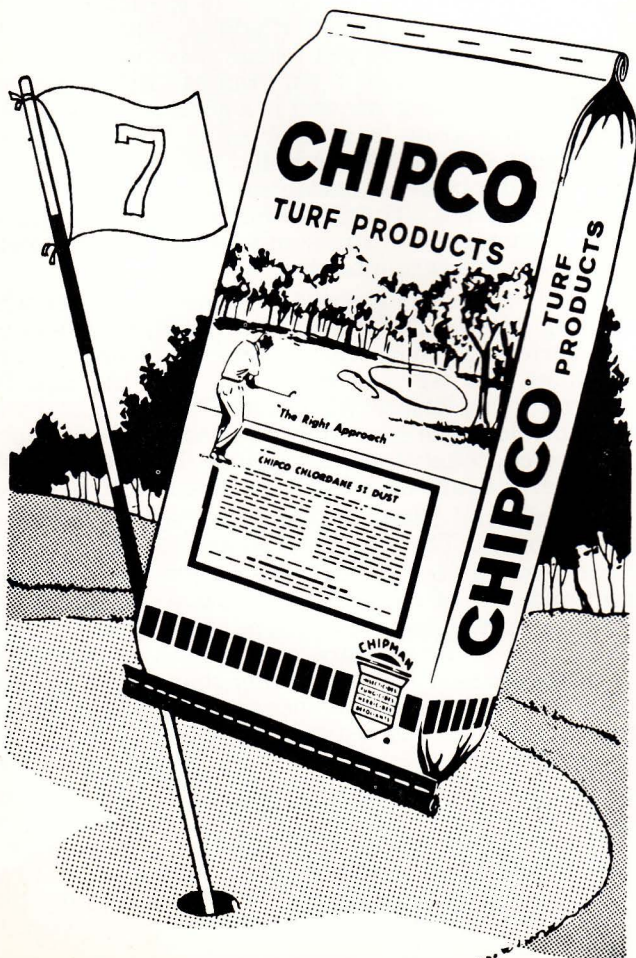
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# Spring Lawn Construction

JOSEPH TROLL, *Turf Specialist*  
*University of Massachusetts*

Spring construction and seeding of a lawn can be successful but it does not have the advantages of a fall seeding. A spring seeding can be risky because of weed competition and possible summer drought damage. To avoid both the competition and summer damage, spring seeding should not be delayed beyond May 18. However, local weather conditions may extend the above date.

The first step in lawn construction often begins with subsoil grading, if the site requires a major change in grade.

The valuable top soil is first removed and piled for later use. The subsoil is then loosened and large stones, sticks, stumps and all debris removed. The holes made by debris removed are filled and the desired grade established. Not less than a two percent surface pitch will provide adequate surface drainage when the final grade is made on the top soil.

If wet areas that pose a sub-drainage problem are encountered, the use of tile drains is advised. However, the above problem is often the exception.

In preparing the final grade, more top soil should be brought in, if needed. Six inches of good loamy soil after settling and compaction is adequate with a minimum of 4 inches. One should note, twenty to twenty-five percent extra top soil is usually needed to take care of settling.

Alternate raking and rolling of the replaced and added top soil is necessary to remove debris and to establish a uniform grade.

If the existing soil is of a very sandy texture, the addition of peat moss, 1000-1500 pounds per 1000 square feet, will increase its water holding capacity. *Caution* — do not allow the peat to form layers; mix it thoroughly with the soil. If the soil is of a good loamy texture, it is doubtful that it will need additional organic matter.

Most New England soils require limestone for best grass growth. Lime not only sweetens the soil, it provides calcium, a necessary plant food, and its reaction in the soil assists in making other plant nutrients available. The amount needed can be determined by sending a representative soil sample to your state experiment station or county agent for testing. If specific recommendations cannot be obtained, mix 100 pounds of ground limestone per 1000 square feet with the upper four inches of soil.

The addition of plant food is the next step in lawn construction. The small grass seeds do not contain a large food reserve, hence, the lack of plant food soon after seed germination can cause lawn failure.

Lawn fertilizers, a source of plant food, are not all the same in type and formulation. In general, they can be classified as organic and inorganic. The organic fertilizers are relatively insoluble and usually are available over a longer period of time. The inorganics are soluble and dissipate quicker.

It is not important to apply a complete fertilizer, one that contains nitrogen, phosphoric acid and potash. The percentages of each are printed on the container appearing as numbers, such as 10-6-4, 10-10-10 and 8-6-4. The first number indicates percent of nitrogen, the second percent phosphoric acid, and the third percent potash.

The complete fertilizer should be thoroughly mixed with the upper four to five inches of soil. If

the nitrogen in the complete fertilizer formulation is entirely inorganic, 20 pounds of the material or 2 pounds of the actual nitrogen per 1000 square feet should be applied. If it has 40 or 50 percent of its nitrogen in a natural organic form, then apply 30-40 pounds of material or 2 to 3 pounds of the actual nitrogen. In addition, add 25 pounds more of superphosphate.

To prevent injury to the turf by insects and grubs, an insecticide, such as Chlordane or Dieldrin, may be applied with the limestone and fertilizer. The amount to add can be determined from the label on the container.

After all the chemicals are mixed into the soil, the final seedbed is prepared. It should be smooth and firm with the upper  $\frac{1}{2}$  inch of surface soil forming a bed of loose material. This can best be accomplished by rolling and loosening the surface soil with a wooden rake.

Seeding after the final seedbed has been prepared can be done either by hand or by a mechanical spreader. Whatever method is used, divide the seed into two equal parts, sow one-half in one direction, the other at right angles to the first. Cover the seed lightly with soil about  $\frac{1}{8}$  inch. This can be done using a wooden rake, applying no more pressure than its weight, and lightly pulling it toward you. Do not push the rake backward and forward; this motion will uncover and distribute the seed unevenly. After the seed is covered, roll with a light roller. This firms the seedbed and hastens germination.

The selection and use of the proper grass species and the purchase of quality seed are very important factors of lawn construction.

There are many grass species but only a few basic lawn grasses are adapted to meet the requirements of lawn turf in New England. Kentucky, Merion bluegrass and the red fescue varieties are recommended as permanent lawn grasses. Both Kentucky and Merion grass grow well in a good loamy soil. Merion will also grow in sandier soils. The red fescues will grow in both sandy soils and in shady areas. Many seed mixtures contain red top, perennial or domestic ryegrass. They are considered nurse grasses are recommended in a mix only when special growing conditions are encountered.

It is advisable to use a mixture of grasses when seeding a lawn. Different grass varieties have different periods of maturity; hence, when one is semi-dormant, the other is vigorously growing and furnishing green color. Also, not all basic grasses are susceptible to the same fungus disease. If one species is infected, chances are the other will remain healthy. In general a mixture of grasses is easier to maintain.

State and Federal Seed Laws require mixtures to be labeled. The labels list kinds of seed in the mixture; percent germination and purity, weed seed content and date of test. If the mixture is of good quality, the permanent grasses mentioned above will predominate. If the mixture contains a high percentage of nurse grasses or species other than the basic types, chances are it will be inexpensive. However, a cheap mixture is more expensive in the end.

The newly established lawn should be mowed when the plants reach a height of about  $1\frac{1}{2}$  inches. Mowing at this height and removal of clippings will help to encourage lateral growth and prevent smothering of young seedlings. However, after the turf has filled in, a lawn seeded to a Kentucky bluegrass, fescue, mix should not be cut less than  $1\frac{1}{2}$  inches.



## PESTICIDE COMPATIBILITY (Continued)

- infection by *Rhizoctenia*, the brown patch fungus (Altman, Colorado).
18. In general, "(1) Insoluble and wetttable powder fungicides do not produce chemical injury unless rates far exceed manufacturer's recommendations. (2) All soluble fungicides can be phytotoxic. Each soluble fungicide has a safety factor and must be used well within the range of this safety factor. When the soluble fungicide is combined with a soluble herbicide, which also has a safety factor, the phytotoxicity is increased.
19. "Pre-emergent herbicides are usually insoluble, wetttable powders and can release sufficient soluble toxins to be of concern. Soluble herbicides are all dangerously phytotoxic and have to be used well within the safety factor limit and should *never* be combined with soluble fertilizers."
20. PMA-cadium nitrate mixtures with nitrogen were injurious in western Washington under cool, moist conditions. Phytotoxicity increased as the nitrogen content increased and where iron sulphate was added to certain mixes. Chelated iron also decreased control with Tag-Caddy combinations (C. J. Gould, *Plant Disease Reporter* 49: 923-27. 1965).
21. Now on the positive side. The following are some of the "normal spraying mixtures" of a leading golf course superintendent in the Chicago area which he considers "to be conservative." Mixes A, B, and C are applied to putting greens and D to fairway turf.
- A. For 36,000 sq. ft. of bent turf  
 6 lbs. Chlordane (50%)  
 6 lbs. thiram (75%)  
 6 lbs. zineb  
 1 lb. Calo-clor  
 2 lbs. iron sulphate  
 16 ozs. spreader-sticker  
 300 gal. water
- B. For 36,000 sq. ft. of bent turf  
 12 lbs. Dyrene  
 6 lbs. Chlordane (50%)  
 2 lbs. iron sulphate  
 16 ozs. spreader-sticker  
 300 gal. water
- C. For 30,000 sq. ft. of bent turf  
 2 pkgs. Acti-dione-Ferrated  
 16 ozs. spreader-sticker  
 300 gal. water
- D. For 4 acres of fairway turf  
 4 pkgs. Acti-dione-Ferrated  
 1 pkg. Acti-dione-RZ  
 300 gal. water

"The Chlordane is only used once a month and never in combination with Acti-dione as per manufacturer's recommendations."

22. The question, "Why don't fungicide manufacturers make up compatibility charts to guide us on what can and cannot be mixed together?" has been asked many times. Part of the answer lies in the points discussed above. We simply don't have enough information for such charts to be of much value, especially for turf.  
 (Taken from *How To Control Plant Diseases*, 2nd edition, November 1966, Iowa State University Press, Ames, Iowa)

## Biology Of The Lawn Chinch Bug\*

S. H. KERR, *Department of Entomology  
 University of Florida*

Recent studies have given us, for the first time, some figures and data on the life history and seasonal development of the Florida lawn chinch bug. The study was conducted in Gainesville. While the data apply only to this climatic region we finally have at least a good start on knowledge about biology of the chinch bug.

Part of the work was done under controlled conditions in the lab, and part in the field. In the lab, the adult females laid an average of 289 eggs each, depositing a few a day (average 4.5 eggs) over a long period of time. The table shows the times for development at different temperatures. Under very warm conditions eggs could hatch in about 1 week; under cooler conditions, it could take up to one month. The young chinch bugs (nymphs) typically molted 5 times in growing to adulthood. In this study, the insect went from egg to adult in as little as 3½ weeks in the warmer temperature.

The work in the field was designed to show how many generations a year there are under outdoor conditions. A lawn was sampled weekly through the warm months and biweekly through the colder months. The data indicate there are 3 complete generations a year in Gainesville, plus a partial fourth generation. These results are in agreement with those from a study in Baton Rouge, La., where the climate is much the same. Similar studies should be made in south Florida, however, where doubtless, there are more generations a year.

Table 1. Life History Data. Length of Different Stages at 2 Temperatures.

	Egg	Nymphal Stage	Egg to Adult	Pre-oviposition period	Length Female	Adult Life Male
83°F	8.8 dys.	25.5 dys.	34.7 dys.	5.6 dys.	70.4 dys.	42.1 dys.
70°F	24.6 dys.	68.9 dys.	93.4 dys.	14.2 dys.		

\* Excerpted from "Biology of the Lawn chinch bug, *Blissus insularis*", Fla. Entomol. 49: 9-18, 1966.

## Turfgrass Abstracts

### WATCH OUT! SALT CONCENTRATES BY FREEZING

WILLIAM H. DANIEL

*Turf Specialist, Purdue University*

Turf managers are accustomed to storing fertilizers in the soil. They apply the material, then it is washed into the soil, where it is held for plant use. Under good conditions high rates of potash and other soluble salts can be applied to turf, then watered promptly before the leaf is desiccated.

After November 1 in the Midwest it is tempting to still put on heavy applications of fertilizer, calcium arsenate, or other materials. But, WATCH OUT — not on the grass overwinter. WHY?

There is a principle involved. WATER FREEZES PURE, thus freezing concentrates the salts. WHERE? On the leaves and in the thatch. Therefore, it is possible for material, which was applied in November, to cause plant damage in February. Normally there is a shorter time lag. Let's look at some case histories.

CASE A. 10-3-7 on greens in 1960, Lakeview Country Club, Illinois, 10 greens fertilized February 27 with normal rates of 10-3-7. All greens damaged by April 3. All greens had some spot undamaged (where snow in December kept ground thawed in February). All greens had more burn where overlap occurred. All greens recovered but slowly.

NOTICE: The superintendent had done the same procedure the previous nine years, as standard winter fertilization, when time permitted; but in '60 there was a light snow. The snow partly melted, dissolved the fertilizer, then very cold weather caused a concentration of the fertilizer salt onto the leaf blades just as though it had been applied in August on dew with drying later in the day. Unusual, different, but occurring.

CASE B. Good lawn in Chicago. An eagerbeaver homeowner applied Sears fertilizer in the spring of 1961. A light snow — then severe cold weather — his lawn was burned badly, new grass came through, and old grass gradually recovered. Again, freezing concentrated the salts applied over the surface. The fertilizer was good material — in good granular condition. Burn did not show within three days after fertilizer was used, but did show two weeks later.

CASE C. Vesper C. C., Massachusetts, 1960. A capable superintendent applied calcium arsenate in November. In January the fairways looked normal. After the big snow (February 28 - April 3) the fairways were quite brown. East facing slopes were less damaged than west facing slopes. Areas shaded by trees showed increasing damage. Spreader pattern showed (to the inch) over seven fairways. He reseeded and renovated the fairways — started over. NOTICE the damage occurred during the cold part of the winter after the arsenic had been partially dissolved. Again the damage was not immediate after treatment.

CASE D. Experimental plots in New Jersey. Two feet wide plots using varying forms of arsenic caused burn when applied in November and February, but not when applied in early April. No rain occurred immediately after each. Damage did not show until after severely cold weather.

The total idea is to be cautious so that salts or chemicals, which may burn foliage, will not be left on the turf or in the thatch overwinter. Heavy fer-

tilization is to be cautioned. Use of arsenics during the winter is to be cautioned.

Now organics with their low solubility, fungicides designed to stay on the foliage, and insecticides when appropriate might be quite alright to spread. In fact, this is the intent in snowmold treatments. Please note only four case histories are given. Note that one showed damage when the same application procedure had been used for ten years.

Three basic rules summarized —

Apply soluble materials only when water can move into the soil. However, if necessary to use, use at light rates (one-half the recommended); then repeat later. Generally it is better to use such materials before irrigation is turned off, before rain stops, before the soil freezes, or to delay until spring when again rains assure distribution into the soil — without the danger of concentration by freezing.

—*Midwest Turf Newsletter*  
November 1966

### GRASS DYES — COLORING COMPOUNDS

ELWYN E. DEAL, *Extension Turf Specialist*  
*University of Maryland*

About this time of year a lot of questions are raised about how to keep grass green all winter long — especially bermudas and zoysias. Actually, this is a rather easy thing to do. You have two choices: *paint the grass green* or *overseed it* with a temporary cool-season grass. It is too late now for overseeding into bermuda and zoysia turf. However, coloring compounds can be used at this time.

Coloring compounds for grasses are not new. Several have been used for a number of years. One of the earliest compounds was malachite green — a rather common laboratory dye used today. Cost has always been one of the major drawbacks. Estimated costs for dyes currently on the market range from a bare minimum of about \$30.00 per acre to a high of about \$500.00 for materials alone.

Several factors figure into the cost of dyes. First is the cost of the material. Second, and probably most important, is the shade of green desired. This may range from a very light green produced by a single dilute spray to a deep emerald green obtained with a concentrated solution that is sprayed on several times. The shade of green may also be determined by existing grasses in the turf, as for example when patching up burned out or diseased areas.

Unless you have had experience with and have access to good spraying equipment, it is best to have a commercial firm do the job. You will need a sprayer which can develop 30 to 60 pounds of pressure. This amount of pressure is required to produce very small droplets of spray which give good uniform coverage. Large drops do not produce good results. Hand sprayers can be used for small jobs but you *must* be very careful to obtain uniform coverage. Light and dark areas will be very noticeable. It is also very important to completely cover all above-ground plant parts so that no dead material is visible through the dye.

Most coloring compounds are made of pigments similar to those in ordinary house paints. Although these compounds are non-toxic, children and pets must be kept off of newly sprayed areas until completely dry or the spray will rub off on them and will also leave spots in the sprayed area. This is

also true for the applicator. Whether walking or riding, the operator should spray *behind* rather than *ahead* of himself to avoid tracking. Once the dye is dry, however, it will not rub off.

*Weeds, Trees and Turf Magazine* published the following list of turf coloring compounds in the June, 1965 issue:

Auragreen\*, Mallinckrodt Chemical Works, St. Louis, Mo.  
 C-9\*, Cornell Chemical & Equipment Co., Baltimore, Md.  
 Envy\*, S. C. Johnson & Son, Inc., Racine, Wisc.  
 Greenstuff\*, Kreiger Color & Chemical Co., Hollywood, Calif.  
 Greenzit\*, W. A. Cleary Corp., New Brunswick, N. J.  
 Lawn Tint\*, Luminall Paints, North Bergen, N. J.\*\*  
 Nu-Type\* Green Lawn Spray, The Gregg Co., Riverton, N. J.\*\*  
 Stayz-Green\*, O. E. Linck Co., Inc., Clifton, N. J.\*\*  
 \*Trade Names  
 \*\*Dyes made by these companies have same patent number.

One or more of these coloring compounds can usually be found at most lawn and turf supply dealers. Better dyes that are less expensive will also probably be appearing on the market in the next few years. You must keep in mind, however, that dyes are only temporary measures and will not stay green indefinitely, although one application on dormant bermuda or zoysia turf in late fall will give rather satisfactory color throughout the winter months.

—*Agronomist*  
 Vol. 3, No. 6, Dec. 1966

### SEED CONTROL OFFICIALS TO CLAMP DOWN ON MISLEADING STATEMENTS

All seed offered for sale for seeding purposes in Massachusetts must be tested and properly labeled states William N. Rice, Director of the Massachusetts Seed Laboratory, at the University in Amherst, Massachusetts.

He states, the Seed Control officials are doing what they can to encourage proper and truthful labels and printed material on all packages of seeds and the Seed Laboratory will analyze the contents of the package to see if they meet the requirements of the law.

False or misleading statements or pictures which imply the seed to be better than it is, will be considered violations of the Massachusetts Seed Law.

Some typical statements which will be considered misleading are: "All Purpose", "Unconditionally Guaranteed", "Engineered For You", and "No Finer Seed For The Money". These statements are considered misleading because there are many conditions for which the statements would not apply, and they are generally false. A picture of a beautiful lawn on a package containing coarse or hay-grass seed will also be considered misleading.

Among other requirements, the label must show the germination percentage and the date of test. The purity percentage must also be stated for field crops or lawn seeds.

—*Seed Laboratory*  
 University of Massachusetts, Amherst, Mass.  
 October, 1966

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## MARKETING TURF-GRASS (Continued)

Horner Sod Farms, Union Grove, Wisconsin, has set up a credit system which has reduced credit losses from 8% before 1964 to less than  $\frac{1}{4}$  of 1% after 1964. They cut credit losses in the following manner:

1. Salesmen were stripped almost completely of authority to grant credit. This authority was reserved for the home office where credit decisions were made objectively away from the competitive battlefield that the salesman operates on. The salesman is much freer to operate when he can blame someone in the home office for refusal to give credit.

2. An individual file for every customer and prospect was next set up. Credit applications, reports from references, reports from credit information organizations, old account ledgers showing the history of how accounts were maintained, etc., were acquired.

3. New invoices were printed and their terms became 30 days from the date of purchase and not from the date of the statement.

4. Perhaps the most valuable addition was a calendar file. The invoices are filed on the number corresponding to the date of purchase and a month later those which have been paid are removed. Those which still have outstanding accounts are notified and the invoice is placed ten days forward. If, within the ten days, the bill is not paid, further credit is cut off. This process is continued until the account is paid or after about four requests the account is turned over to a collection agency.

**VIII. The Public Relations Department:** Public relations is the business of gaining and maintaining public understanding and support. It is the planned effort of a business organization to integrate itself into the society in which it exists.

The public relations expert is an evaluator of attitudes, beliefs, trends and goals. He is a counselor to management in sociological and decision making areas. The public relations expert must understand people and needs to be an excellent communicator. Judgement, orderly thinking, writing ability, creativity and energy are a few of the requirements expected of a public relations expert.

In the business of sod production the task of developing and maintaining attitudes on the part of the general public which are favorable to the company and sympathetic toward its objectives, programs, and activities is beginning to grow in importance. To help tell the story of "Warren Lawns" established with sod, a public relations agency is retained to continuously place news items in leading magazines, newspapers and trade journals.

Finally, good public relations should have a sound foundation at home. This requires, to begin with, a thorough review of basic company policies, programs, and objectives. These should be in line with good practice and generally accepted standards of social values and ethics. Programs of employee education should be undertaken. Recreational facilities should be provided. The satisfied employee will support their company in their private conversations, at group meetings and in various other communication media.

In summary, preoccupation with production has generally kept marketing in the background. Although the techniques discussed above have produced excellent results, competition in the future will necessitate further investigation of marketing theories by

sod producers. Thus, for the next ten years the most important and far reaching of all developments will be neither methods nor skills, but the changes in men's minds and their attitudes towards marketing procedures. Those sod producing companies which do succeed in making successful adjustments in their marketing system structure will reap rewards such as have rarely been offered to companies since the early years of the turf-grass industry.

## Pesticide Names -- Guidelines For Their Use In Communicating To Your Audience

E. H. WHEELER, *Professor of Entomology*

*Leader, Pesticide Chemicals Program  
University of Massachusetts, Amherst, Mass.*

We urge people to Read Labels! This is right. We should use names or designations that are required on labels. This is right, too!

The Ingredient Statement is the *only* place on a label where active ingredients are identified *exactly* by officially acceptable names or designations.

Therefore, we should identify active ingredient statements.

These names have been accepted by the Pesticide Regulation Division, USDA. Such names are *official* — they are the only names approved by a governmental regulatory agency for identifying specific chemicals in commercial products at the time the labels were cleared. At present, relatively few chemicals have official *common* names, thus the need for these guidelines.

Common (coined, generic) names or designations, *acceptable to PRD* — and therefore *official* — are required in ingredient statements on labels. They identify specific chemicals. *We should use these officially acceptable names.*

They are the names people can always find to read on up-to-date labels. The *officially accepted common name must appear on labels of all products containing that chemical* irrespective of the trade mark or tradename.

But — officially acceptable *common* names or designations have not been announced for some chemicals. Labels on products containing such chemicals must have the long, often complex, but officially acceptable, *chemical* names in the ingredient statements.

It is ridiculous to use these complex chemical names in communicating to the general public (or, for many of us, even to each other). But it is just as illogical to employ names or designations that *may* appear elsewhere on labels, but usually do not.

Therefore, in communicating to the general public — anybody but an expert in your field — employ trade names *if there is no officially accepted common name*. Do not use *unofficial* names or designations. You cannot be sure people will find these on labels; you will add to the confusion and lose the confidence of your audience.

But remember! If there is an official common name let's use it! That common name appears on all up-to-date labels. Your audience will soon learn it too.

Officially Acceptable Common Names of Available  
Pesticides as Required in Ingredient  
Statements on Labels  
(We should use these names to identify  
specific chemicals)

<b>ACARICIDES</b>	cypromid
binapacryl	dalapon
chlorbenzide	dicamba
ovex	dichlorbenil
tetradifon	dicryl
<b>INSECTICIDES</b>	diphenamid
aldrin	diquat
allethrin	diuron
carbaryl	endothall
carbophenothion	erbon
chlordan	fenuron
demeton	isocil
dieldrin	lenacil
dimethoate	linuron
dioxathion	monuron
endosulfan	neburon
endrin	norea
ethion	paraquat
heptachlor	siduron
lindane	silvex
malathion	simazine
methoxychlor	solan
naled	swep
parathion	tricamba
phorate	trietazine
phosphamidon	trifluralin
ronnel	<b>FUNGICIDES</b>
toxaphene	captan
<b>RODENTICIDES</b>	chloranil
diphacinone	dichlone
warfarin	dodine
<b>HERBICIDES</b>	ferbam
amiben	folpet
amitrole	glyodin
atrazine	maneb
barban	nabam
bromacil	thiram
bromoxynil	zineb
chlorzazine	ziram

**EXAMPLE:** Why use *carbaryl* instead of *Sevin*? Just this! There are products on retailer's shelves that contain carbaryl (1-naphthyl methylcarbamate) that do not have the word *Sevin* anywhere on the labels; the word carbaryl is there! **Use a name that must appear on labels.**

To associate less familiar, official common names with trade names, follow the common name with trades name(s) in parenthesis until the former become better known.

## Early Spring Lawn Advice

JOSEPH TROLL, *Turf Specialist*  
University of Massachusetts

A conscientious early spring maintenance program can improve both the health of the existing turf grass and its aesthetic value.

When weather permits, the lawn should be raked vigorously with a sharp-tooth lawn rake to remove leaves, dead grass and other debris. If there are areas where the roots have been smothered by debris, plants killed by disease or winter injury, rake down to the soil and remove all vegetation. It might be necessary to fill these raked bare areas with topsoil to make the surface even. However, if this is not the case, it is still necessary in bare spots to scarify the surface soil to provide a seedbed.

Often, after the snow recedes, irregular circular patches of greyish matted grass appear. Symptoms of this type can be attributed to a fungus caused disease known as "snow mold." These patches should be brushed to break up the mat and followed by an application of fertilizer to stimulate grass growth.

Grass plants which have been heaved by frost action can be pressed back into the sod by rolling. Young plants which do not have a fully developed root system are especially prone to heaving.

Rolling is best done with a water ballast roller when soil moisture conditions are right. A water saturated sod, especially a heavy clay sod, when rolled will pack which can result in injury to the turf. In fact, these compacted areas help weeds come in and eliminate desirable grasses. Lighter sandy soils, if well drained, are less subject to packing by rolling. In general, one can roll the turf when the soil surface is dry and the soil below is moist but will not seep water when a weight is placed upon it.

After the lawn has been raked and rolled it should be fertilized. Lime should also be applied, if needed.

The application of limestone is essential in a lawn maintenance program. It corrects soil acidity and performs other functions necessary for good grass growth. If applied in the limestone form and not as hydrated lime, it can be applied with the fertilizer. The amount needed can be determined by sending a soil sample to your county agent for testing.

An important step in a spring lawn maintenance program is the application of a complete fertilizer, one which contains nitrogen, phosphorus and potassium (Expressed as N-P-K). Fertilizer grades such as 10-6-4, 8-6-4 or similar grades should be applied at the rate of 15 to 20 pounds per 1,000 square feet.

To prevent burning of the grass blades, apply when the grass is dry. Also, apply both the lime and fertilizer materials uniformly and avoid skips and overlapping. After all the fertilizer and lime have been applied, seed all bare and/or thinned out areas.

In bare areas, loosen the sod with a rake. Seed with a good basic turf seed (Kentucky bluegrass and/or a fine fescue), then rake to cover lightly and follow by rolling to firm the seedbed.

If insect grubs and broadleaved weeds are a problem, chemical control of these pests should be included in a spring lawn maintenance program. Plantain, dandelion and other broadleaved weeds are easily controlled by an application of the chemical herbicide 2,4-D, especially during the period when weeds are actively growing during springtime. Whenever chemicals are used always read the label for exact instructions and follow them closely. Remember when you have chemicals on hand keep them locked up or out of reach, in a place where they can be taken from easily.

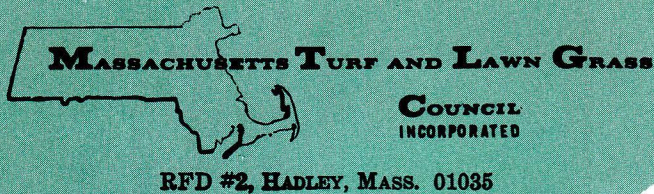
## BANVEL D+ 2,4-D APPROVED

A new label registration has been approved for granular Banvel D+2,-4-D for control of clover, knotweed, chickweed and dandelion in established lawns. Velsicol Chemical Corporation says the granular formulation should be applied in the spring or fall to established lawns, golf course fairways, tees, aprons and roughs. It may also be used on newly seeded lawns after the second cutting in the spring. Lawns should not be mowed or watered for 24 hours after application which should be made to moist grass for best results.

—Seed World

Vol. 99, No. 7, Nov. 11, 1966

FROM



TURF BULLETIN

## TROLLING

### PERHAPS GOLF CAN FOSTER WORLD PEACE

BEM PRICE, *Washington A.P.*

The possibility that anthropologists have unwittingly discovered an aspect of human behavior which could unlock the doors to world peace is under some discussion here.

A number of studies have accumulated in government archives which show that some primitive peoples work off frustrations by banging the ground with sticks.

The significance of this activity for modern man was almost universally overlooked until a political science student detected the extraordinary parallel between ground-pounding and the modern game known as golf.

From this he has postulated a nation's peace-loving quotient can be accurately established by counting the numbers engaged in golf.

Preliminary investigation indicates that where golfing is widespread no dictatorship can long survive. The anonymous scientist's initial findings are impressive and are here reported for the very first time.

For example, there are no known golf courses in the Soviet Union, Red China, Poland, Rumania, Bulgaria or Albania. The number of courses in once-democratic Czechoslovakia has been reduced to two and they are primarily for the use of decadent Western diplomats.

The Communists reportedly object to golf on the grounds that it creates capitalistic class distinctions. Obviously, anyone who plays golf requires considerable capital.

Of equal significance is the fact that the English-speaking peoples, who have a long and unbroken history of self-government, are the world's most avid golfers.

For example, there are 8,667 golf courses in the United States and around eight million golfers. The Australians have approximately 1,100 golf courses and 500,000 practitioners, while the English and Scottish countryside maintains around 1,000 courses for 1.5 million golfers.

The French supposedly have a passion for reason and logic, but the fact remains that their political history has been a turbulent one. This is not particularly surprising, since France has only 80 golf courses and around 7,500 golfers.

## Join Your Massachusetts Turf And Lawn Grass Council

For more information write:

Mass. Turf and Lawn Grass Council

attn.: Dr. Joseph Troll

RFD #2, Hadley, Mass., 01035

or

George Moore, President MTLGC

1295 State St., Springfield, Mass.

The Massachusetts Turf and Lawn Grass Council is a non-profit corporation. Its officers derive no benefits except the satisfaction of keeping Massachusetts and its neighbors first in turf. It was founded on the principle of "Better Turf Through Research and Education." We must support our University to accomplish this, and we can with a large and strong Turf Council.

Membership is not restricted to Massachusetts residents or turf professionals alone, all are welcome to take part. Write today.

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See Page 13 for Program

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