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Draft-sensing 3-point hitch. Just set it and forget it for blade or scraper jobs. The hitch senses condition changes and adjusts itself up or down instantly for fractional inch control of attachments.

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The new International 2424 is a turf tractor well worth a study at your IH dealer's. And easy to own. Your dealer offers one, two and three-year financing. Deferred payments—up to three a year with no extra charge. Leasing. Leasing with an option to buy. Or *you* suggest something. He wants to make a deal!

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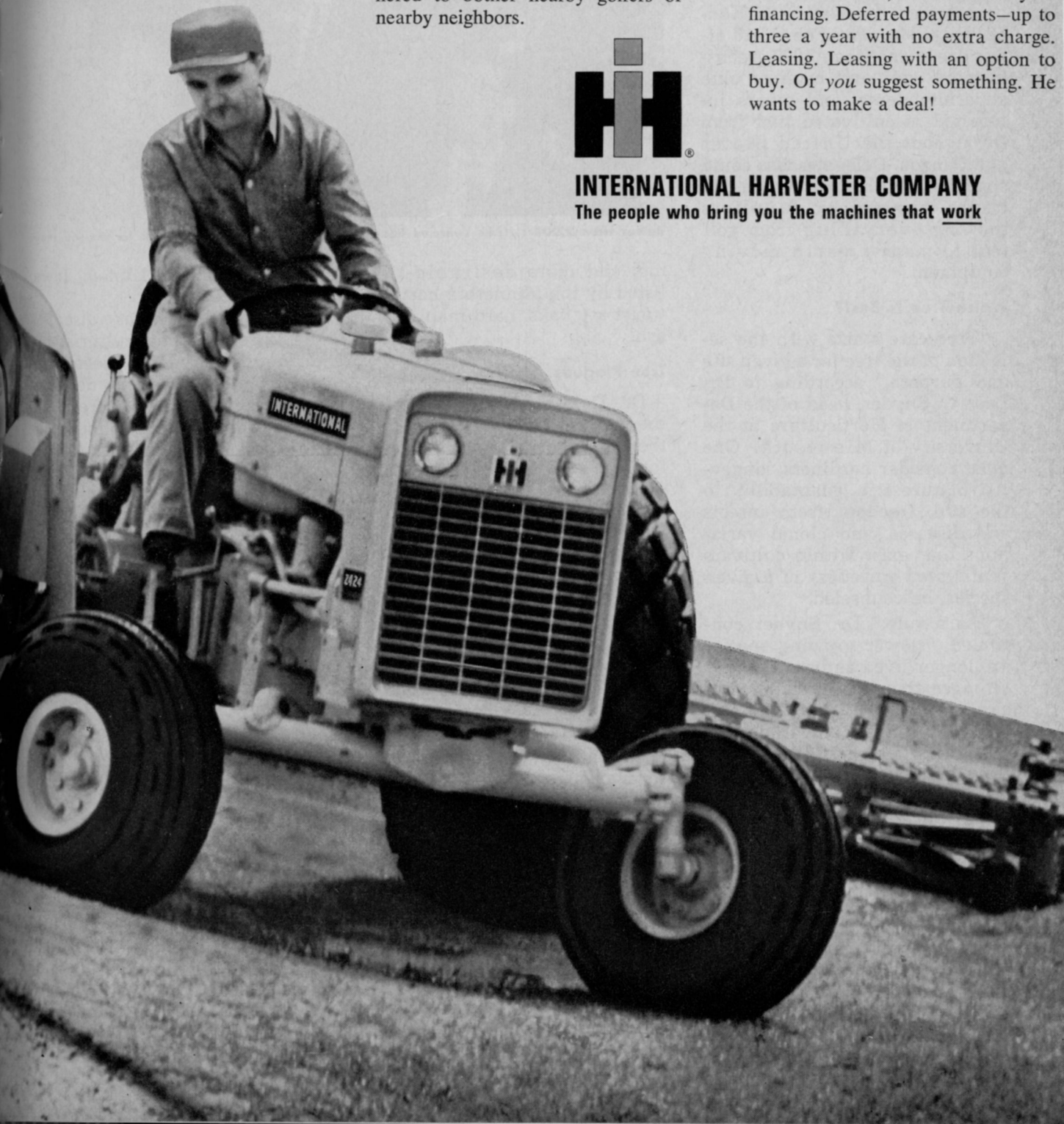

Turfmen Must Be Treemen, Too, Delegates Shown At 37th Int'l Turfgrass Conference in Kansas City

The increasing complexity of golf course greens management means superintendents must not only be knowledgeable in all phases of turf care and weed control, but be experts in tree maintenance as well. This was especially evident last month at the 37th International Turfgrass Conference and Show staged by the Golf Course Superintendents of America Association in Kansas City, Mo. The Feb. 13-18 affair drew more than 2,000 greenskeepers, golf and country club superintendents, and others interested in cultivated turf from throughout the United States and Canada. Delegates also could shop among the more than 115 booths manned by suppliers showing everything from golf tees to massive earth moving equipment.

Better than 2,200 turfmen swarmed into Kansas City's Municipal auditorium for the '66 show.

Which Tree Is Best?

"Tree care starts with the selection of the tree for a given site and purpose," according to Dr. Leon C. Snyder, head of the Department of Horticulture at the University of Minnesota. One must consider hardiness, longevity, mature size, adaptability to the site, freedom from insects and diseases, and clonal variations that exist within cultivars (cultivated varieties) of a given species, he counseled.

"As a rule," Dr. Snyder continued, "slower growing species are longer lived and structurally stronger than fast-growing species. Bolleana Poplar, Populus alba 'Bolleana,' Lombardy Poplar, and Populus italica nigra, Silver Maple, Acer saccharinum and Robusta Poplar, and Populus x robusta, are recognized as being fast growing, but relatively short lived. The Silver Maple," he admitted, "is actually not short lived but its usefulness as an ornamental tree is certainly limited. As this species reaches maturity, it is subject to breakage by winds and ice storms."

The more hardy, slower growing, and more desirable trees listed by the Minnesota horticulturist are oaks, hard maples and ash.

Tree Plagues

Dr. Dale M. Norris, Jr., from the University of Wisconsin, told the group of cures he's found for some of the diseases which plague trees.

Oak wilt, caused by the fungus, *Ceratocystis fagacearum*, can be "stopped in its tracks," according to Dr. Norris, by a thorough program of rootgraft breakage between adjacent oaks. "This prevents the spread of the lethal fungus from tree to tree down the fairway through interconnected roots.

"You may simply trench a few-inch wide ditch down about 30 inches in the soil along a line midway between oaks that are 50 ft. or less apart. You can also inject a soil-sterilizing chemical, such as Vapam, into holes drilled in a similar line between the trees and kill a portion of the roots and thus prevent fungus spread," he said.

Elm phloem necrosis is a second tree killer in many central and more southern states, such as Ohio, Indiana, Illinois, Iowa, Nebraska, etc.

"This lethal virus disease," the Wisconsin horticulturist explained, "has never been adequately studied, but we do know that it spreads readily from elm to elm through root connections. Thus, rootgraft breakage is a must in any control program. In addition, a sucking insect, a leafhopper, extracts the virus from leaves of diseased elms and effectively inoculates it into the foliage of healthy elms. This insect flies, or is carried by the wind, for miles. Spraying with insecticides, such as DDT, on the foliage of healthy elms in the late spring is our only control measure against leafhopper spread of the virus," Norris suggested. Diseased trees must be quickly removed and destroyed, he said.

Effect of Light and Heat on Turf

Every physiological process occurring in plants is affected by temperature, and only light can supply the energy used by green plants, so turfmen must understand the varying interrelations between these two important

(Continued on page 34)

Quit brooding over the winter campaign, Nap. Get a good start with NITROFORM®

Like Napoleon, turf and ornamentals had a rough winter. Heavy snows and sudden cold waves took the toll of weak plants. And with the spring, turf traffic becomes heavy.

A spring feeding with Nitroform restores turf damaged during the winter, and takes advantage of the peak growing cycle of warm-season grasses. This spring feeding also allows turfgrass to spread out with a good growing start ahead of the weeds. Spring feeding with Nitroform strengthens any plant and builds residual nitrogen.

Nitroform®, Hercules Powder Company's ureaform plant food, contains a whopping 38% nitrogen, but releases it slowly as the plant needs it. Nitroform is easy to handle and store, is odorless and nonburning, and is available in two forms: Blue Chip® for dry application, and Powder Blue* for liquid application. Also, the granular form is used in balanced fertilizers that carry the "Blue Chip" tag.

Nitroform is used on turf, trees, ornamentals, and any plants that require sustained nitrogen feeding.

CATCH CRABGRASS NAPPING, TOO, WITH AZAK®

Azak® pre-emergence herbicide stops crabgrass before it gets started. Applied to established turf before warm weather and moisture awaken the crabgrass seeds, Azak prevents seed germination and initial growth. Nonleaching, one application lasts through the germination period. Another economy turf managers like is that a 12.5-lb. bag of wettable powder covers one acre, or 43,560 sq. ft. Azak is also available in granular form, which can be mixed with fertilizers and other pesticides.

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STH66-2

Nozzle Wear, DED Are Topics at Illinois Custom Spray Operator's Training School

More than 30 papers were presented to midwestern spraymen who gathered at Urbana, Ill. for the 18th Illinois Custom Spray Operator's Training School, Jan. 26-27. Reports were given by university weed control researchers, and municipal and Ill. Natural History Survey workers. New techniques were described for agronomic weed control, and equipment maintenance was a major concern.

Spray Pattern, Output Change with Nozzle Wear

"The abrasive action of sprays causes wear on nozzle tips," E. L. Knake, Associate Professor of Weed Extension, University of Illinois, Urbana, told the spray operators. He explained that changes in the volume sprayed, or distribution pattern caused by abrasion, may damage adjacent plants, cause residue problems, and increase application costs.

Knake described tests conducted to determine the amount of wear and the efficiency of new and used spray nozzles. In the laboratory, he said, new and used nozzles were tested by using pure tap water in a device operated at 30 lbs. per sq. inch (PSI). Water from each nozzle was collected in beakers, measured, and recorded in terms of milliliters per minute. Spray distribution patterns were also determined.

"Since wear on the nozzle tip changes the spray distribution pattern," Knake concluded, "nozzle tips should be replaced periodically. Our test results indicate that brass nozzle tips should be replaced after each tip has been used for approximately 100 acres, to maintain the desired spray pattern.

"Since output from brass nozzles increases rapidly with wear, it is important to regularly calibrate spray equipment. Our study along with others show a possible 10% increase in output after 250 gallons of spray have passed through a nozzle tip.

"The output of the new brass nozzle tips that were checked was quite consistent, and their distribution pattern was satisfactory. However, periodic replacement should be considered a wise investment, since the distribution pattern of both liquid and wettable-powder formulations change considerably with

U. of Ill. extension entomologist H. B. Petty (right) previews program of the 18th Annual Custom Spray Operators School held recently on the university's campus. From the left are Ken Caldwell, Creston, Iowa, custom spray operator; Dr. J. B. Claar, director of U. of I. Co-operative Extension Service; entomologist Jim Paullus, Rochelle, associated with the Del Monte Co., and Petty.

wear." Stainless steel tips may be used to good advantage, he pointed out. They cost more, about $1.50 compared with 50¢ for brass tips, but they are more resistant to wear and would not need to be replaced as often as brass tips.

DED Stopped in Route

"Dutch elm disease, one of the most destructive diseases of trees in the United States, kills thousands of elms annually," J. C. Carter, Head, Illinois Natural History Survey, Plant Pathology and Botany Section, reported to the attentive spraymen. "In the Champaign-Urbana, Ill. area, it has killed over 78% of the elms since 1951.

"Healthy elms," he explained, "within 25 feet of diseased elms frequently become infected by transmission of the DED fungus through grafted roots. This transmission of the fungus can be prevented by injecting Vapam into the soil. One part Vapam to 3 parts water is placed in holes 15 inches deep and 6 inches apart in a band between the diseased and healthy trees. One-half cup of the Vapam solution is placed in each hole. In the treated zone, Vapam kills roots, and therefore the DED fungus can not pass from tree to tree through their roots."

The Illinois Natural History Survey recommends methoxychlor for the control of elm bark beetles which carry the elm disease fungus. It suggests a 12% solution of insecticide if applied with a mistblower, or a 2% solution if sprayed with a hydraulic sprayer. Also, sanitary measures for the removal and destruction of all elm material in which elm bark beetles can colonize are recommended.

Grasslands Book Revised

The 707-page book, "Forages: The Science of Grassland Agriculture," contains material on all aspects of grasslands production. Completely revised, it is now available from the Iowa State University Press, Ames, Iowa. Price is $8.50 per copy. The work has won international recognition for its educational value.

Weeds, Diseases, Sod Industry, Grass Varieties, Play Major Role at Rocky Mountain Turfgrass Conference

Weeds, diseases, the sod industry, and grass varieties were pegged for special attention during the Rocky Mountain Regional Turfgrass Conference held at Colorado State University, Fort Collins, Jan. 26-27.

Leadoff speaker to address more than 150 persons interested in producing, selling, installing, and maintaining turf was P. Eugene Heikes, CSU extension weed specialist. He pointed out that major weed problems in the Rocky Mountain area are dandelion, broadleaf plantain, Japanese clover, ground ivy, hairy crabgrass, bentgrass, quackgrass, and a number of coarse-bladed grasses.

"Hairy crabgrass, although an annual weed, can take over a lawn due to the difference in growth habits between it and bluegrass," Heikes explained. "It grows most rapidly in the heat of summer when bluegrass is dormant and slow growing."

"Bentgrass is fine, if all the lawn is of the same variety. It can stand close mowing and hard usage. But bent, mixed in a bluegrass lawn, is undesirable. Its different color and growth habits give the lawn a patchy appearance," Heikes concluded.

Crabgrass research findings were reviewed by John W. May, plant pathologist at CSU. May said that 63 materials were tested. These included new experimental materials as well as the old "standbys." Of the materials tested on common Kentucky bluegrass, May said, Zytron, Trifluralin, Dacthal, Bandane, Azak, 296-B, and Betasan produced best results last year under Colorado conditions.

May cautioned that Colorado had an unusually cool, wet, late spring which may have been responsible for poorer performance of some of the materials in the test.

Harebell Can Be Controlled

Hard-to-kill weeds in turfgrass was Homer Hepworth's topic. He revealed that Colorado's creeping harebell could be controlled with a 1½-lb.-per-acre application of Banvel-D. This treatment gave 95% top kill of harebell and 100% control of dandelion, knotweed, and kochia. At 2 lbs./A, the herbicide effected a 100% top kill of all three weeds.

Hepworth, who is plant pathologist with CSU, noted that bentgrass could be killed with excessive rates of nitrogen and the soil could be replanted with bluegrass soon after treatment. A 24% nitrogen aqueous ammonia solution or 20 lbs. of ammonium sulfate per 1,000 square feet was used to kill the bentgrass.

Colorado's booming sod industry, with a predicted 1966 sales potential of $6,500,000, was thoroughly examined and discussed by a panel of experts. Dr. Jess Fults of the university's plant pathology department said, "The business is so new that most people don't know what quality is. There is a place for pasture or meadow sod in farm conservation work, but cultivated sod is a landscaping tool and deserves higher quality."

Use of good-quality seed, establishing the sod in areas relatively free of turf diseases and not heavily infested with deep-rooted perennial weeds, is preferred. The trend, Fults said, is for sod growers to use one species of grass and not a mixture.

J. Russell Wilkins of Green Valley Turf Co., Littleton, outlined production methods used by his company. This covered all phases from germination to sod harvest. He explained use of fertilizers, automatic sprinkling systems, and other tricks of the trade developed on his sod farm. He uses both liquid and dry fertilizers, and finds that best growth results from light seeding. He plants 50 lbs. of seed to the acre and finds that grass fills in and develops a better root system.

Charles Drage, extension hor-

With Colorado's sod industry booming to a predicted $6,500,000 in 1966, this panel offered up-to-date information for better sod production. From the left, they are Charles Drage, Dr. Jess Fults, both of Colorado State University; J. Russell Wilkins, Green Valley Turf Co., Littleton; Melvin C. Rich, Richlawn Turf Farm, Littleton; and Frank C. Stewart, president of the Rocky Mountain Turfgrass Association.

Weeds in turf . . . seemingly endless problem with turfmen everywhere . . . was the topic of these three Colorado State University specialists during recent Rocky Mountain Regional Turfgrass Conference. From left: Homer M. Hepworth, plant pathologist; Eugene Heikes, extension weed specialist; and John W. May, experimental station plant pathologist. They reviewed current research and recommended weed control practices.

ticulturist with CSU, detailed recommended practices for soil preparation where sod is to be laid. Adding phosphate to the soil for root development and also a little nitrogen will give sod much aid in becoming established. Most of the nitrogen should be applied from the top.

"Also, this area needs modifications to the soil in addition to nutrients," Drage added. "If the soil is alkaline, use some agricultural sulphur and try to improve the physical properties of the soil as well, at this time."

Most panel members recommended a 1-inch cut to harvest sod. All agreed thin sod takes hold faster so that the nurseryman is selling sod not soil.

Frank C. Stewart, Littleton, president of the Rocky Mountain Turfgrass Assn., said selling sod by telling customers they will save water may be misleading. "You can save some water but not all of it. You have installed one inch of root system. Six to seven inches of the roots have been left behind. Advise the customer to treat sod as he would new seed."

Melvin C. Rich of Richlawn Turf Farm, Littleton, suggested "Keep instructions simple for the homeowner. Tell him to do twice as much watering—maybe he'll do half of it."

The intricate subject of installation and bidding sod jobs was the topic of Ben Warren, Warren Turf Farms, Chicago, Ill. He outlined three varying types of sod jobs: the fine turf area for putting, bowling or tennis greens; the home or small industrial lawn; and the large industrial or highway sodding contract.

"Specifications on fine turf may be provided by a golf course architect — but then, you may have to provide your own specs. In bidding these jobs, consider that you will have to give the utmost attention to soil preparation, grading, and laying. The job must be near perfect, and no matter how well it is done, it won't be good enough," he said.

Misunderstandings are main problems of fine turf jobs. Make it understood where your job ends. If maintenance is included, you'll have considerable work. Check water availability and test the existing irrigation or sprinkling system before sod is installed, Warren warned. Subsoil, thoroughly prepared, is just as successful for sod base as topsoil that must be hauled to the site.

Specifications cover all highway bidding, Warren said. Sometimes specifications are written

(Continued on page 32)

Bidding and installation of sod is a serious business, particularly with highway projects and large industrial areas, Ben Warren, of Warren Turf Farms, Chicago, Ill., told the conference.

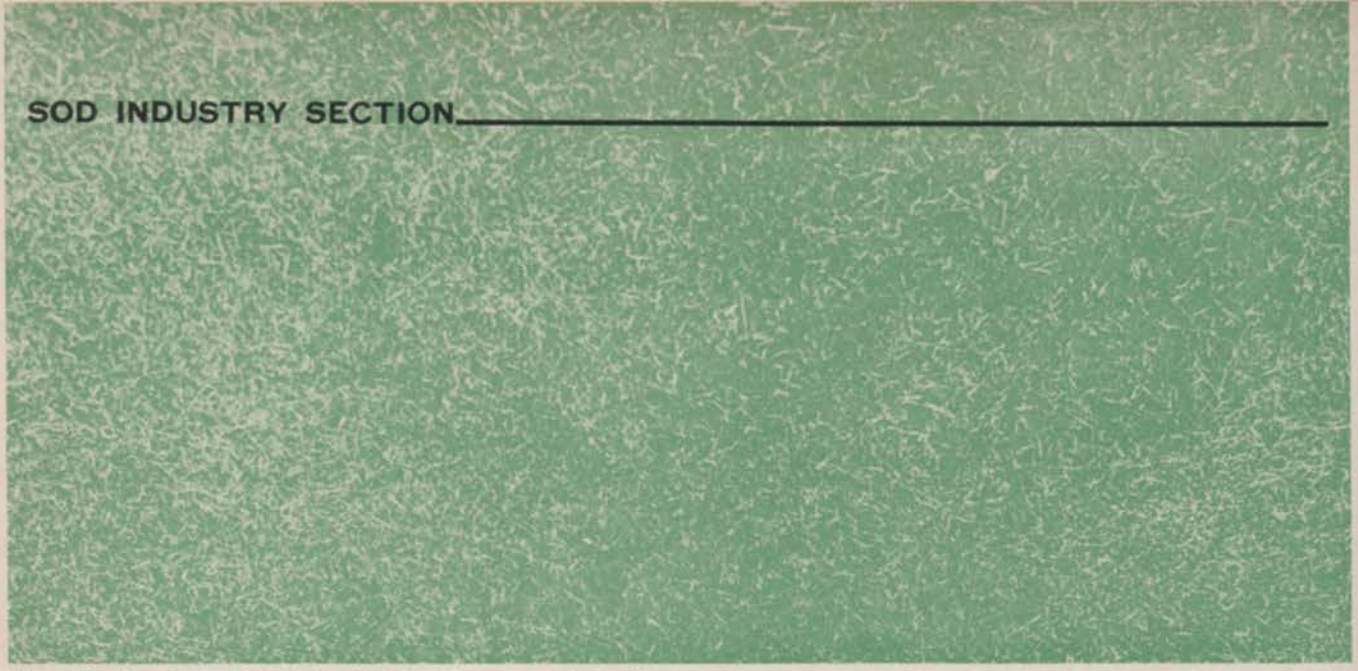


Figure 1. A mature sod of Merion Kentucky bluegrass ready for lifting. This represents the end result of following the practices and principles of establishing a uniform stand of turfgrasses and provided with proper maintenance. Portion of this field qualified for New Jersey certified sod.

How to Establish a Uniform Stand for Turfgrass Sod

By DR. HENRY W. INDYK
Extension Specialist in Turf Management
Rutgers University, New Brunswick, New Jersey

PRODUCTION, marketing, and utilization of sod as a vegetative means of quickly establishing lawn and other turfgrass areas is intimately associated with a high quality product. Sod quality is the net result of a combination of factors involving basic principles and practices of sod production. The degree to which they are incorporated into sod production will greatly influence or determine the quality of the marketable product.

An important criterion for measuring sod quality is the uniformity of stand of the desired turfgrass or mixture of turfgrasses. Successful establishment of a uniform stand, and its proper management after establishment, will produce a uniform and dense carpet of green leaves above the soil. More importantly, a well developed, extensive rhizome and root system will be produced below the soil when the turfgrass is fully and uniformly developed. (Figure 1)

Thin or bare areas can be corrected with proper overseeding techniques when recognized during the early development stages of a newly seeded sod field. However, such deficiencies in a mature sod present a problem at harvest time. These thin or bare areas complicate as well as delay "lifting" of sod. In addition, it becomes very wasteful because of the necessity of discarding sod pieces (such as illustrated in Figure 2) containing bare or thin areas. It is particularly wasteful when considered from the standpoint that such areas may comprise only 1% or less of an otherwise high-quality strip or roll of sod.

Realizing the importance of uniformity of stand of turfgrasses in relation to sod quality, sod growers should be overconscious of the principles and practices of sod production which aid

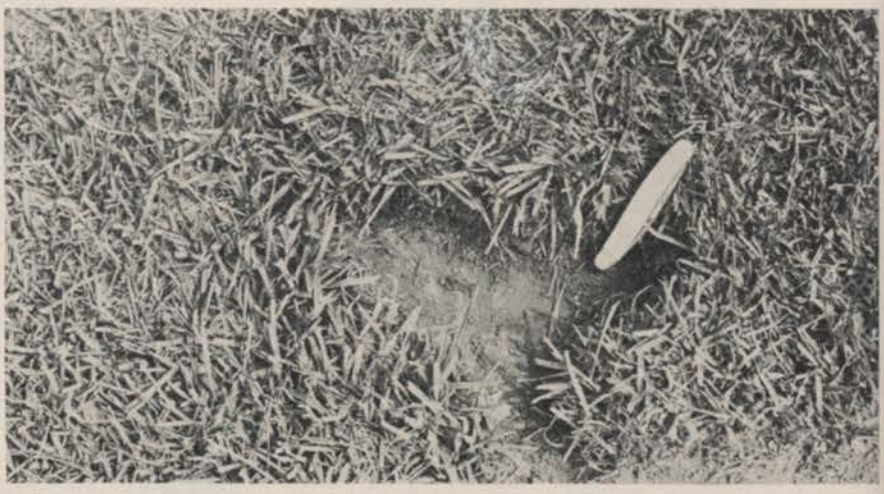


Figure 2. Lack of a uniform stand of the desired turfgrass has resulted in this type of condition in an otherwise high quality strip of harvested sod.

Here's how easy it is to get long-lasting control of nematodes and soil insects that ruin turf

- A single spray of Nemagon® Soil Fumigant kills root-choking nematodes all season.
- A single application of dieldrin insecticide controls root-pruning insects for years.

THE FACTS that follow quickly explain the essential value of controlling soil pests with Nemagon and dieldrin; their flexibility and ease of use; why the root protection they provide far outweighs the cost of treatment.

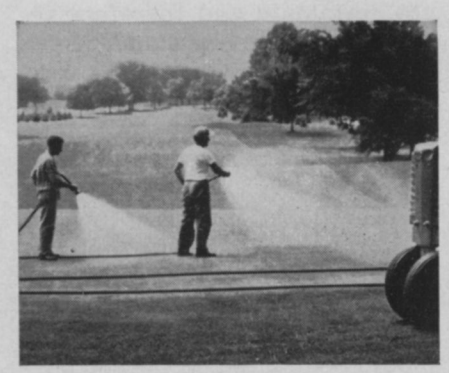
Nematode control with Nemagon

Nemagon works as a pre-planting application or on established turf. It fumigates the root zone to kill the nematodes (microscopic worms, not insects) that can infest soil in fantastic numbers. All damaging species are controlled and reinfestation will normally not occur for a year or more.

Without the root knots and lesions caused by nematodes, water and soil

A Nemagon spray knocks out nematodes fast, and thoroughly. Turf isn't disturbed. And nearby plants won't be injured.

nutrients can pass freely through roots. Turf can respond fully to fertilizer and irrigation. Risk of stunting, poor appearance and dead patches is eliminated. So is the risk of a reseeding or



Protecting a golf green with Nemagon eliminates any chance of unsuspected nematode infestation causing costly damage and disrupting play.

resodding.

Nemagon is easily drenched into soil following a spray application. There's no need for special equipment and grass isn't disturbed. Easy-to-follow directions are printed on every package.

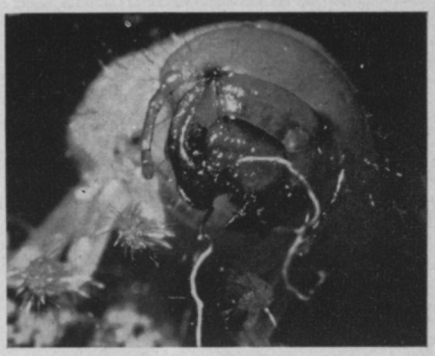
Soil insect control with dieldrin

Dieldrin controls all species of grubs, including the larvae of Japanese and June beetles. It can be used ahead of time to prevent damage from ever starting. Or you can apply dieldrin to stop an infestation when discolored turf indicates that soil insects are pruning roots and limiting the crop's access to fertilizer and water.

Dieldrin can be applied any time after soil warms up. Effectiveness usually lasts 3 to 5 years. Control is so thorough that grub-eating moles and rodents can't find food in the treated area and leave.

Dieldrin can be put on in fertilizer, or in granular form. Liquid concentrates and wettable powders are available for spray use and drenching.

Full details on using dieldrin for



This root-chewing white grub can kill turf or make it look sick. So can a host of other grubs and soil insects. Dieldrin stops them all.

control of soil or surface insects are on every package label.

Nemagon and dieldrin are both available as branded products of well-known manufacturers and sold where you normally buy insecticides, and other turf maintenance products.

For more information, write Shell Chemical Company, Agricultural Chemicals Division, 110 West 51st St., New York, New York 10020.

Follow label directions carefully when using any pesticide.

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in getting a uniform stand. Let us consider factors which contribute to a uniform stand of turfgrass in the production of a high quality sod.

Weeds: Key to Land Selection

Observation of weed growth in an area before seeding will be time well spent in determining the suitability of a particular field for sod production. Avoid seeding fields which are known to be infested with difficult-to-control weeds such as quackgrass, bermudagrass, johnsongrass, nutgrass or other pernicious perennial weeds. Weed problems of this nature can not be resolved by selective control procedures in an established sod field. The best approach to control of weed infestations of this type is complete eradication before seeding.

Fields infested with difficult-to-control weeds can be made suitable with the proper use of chemicals, in combination with cultural practices. Chemicals are available which can be used as soil sterilants or others which are nonselective or specific for perennial grasses. Clean cultivation or clean fallow are helpful cultural practices. Use of cultural practices in preparation for sod production is advisable for two or more years before seeding any fields which have not been cultivated for the preceding five or more years.

Soil Preparation Affects Quality of Turf Stand

Proper soil preparation requires more patient and painstaking techniques than are normally required for other agricultural crops. Carelessly prepared fields may affect not only the stand of turfgrass obtained, but also its future management. Soil preparation involves proper provision for physical and chemical conditions.

Physical conditioning begins with mechanical preparation which may involve subsoiling, plowing, rototilling, discing, harrowing, and culti-packing. The objective or end result of using such implements is the preparation of a level, finely granulated but not pulverized seedbed that is smooth and firm. Utmost care should be taken to provide as level a seedbed as possible. An uneven seedbed affects seeding operations from the standpoint of variable depths of planting.

Seed planted too deeply will not germinate and therefore result in an uneven stand. As a general rule, the larger the seed size, the more tolerant it is to deeper planting. For example, a seed such as red fescue which is approximately 8 times as large as Kentucky bluegrass would tolerate deeper planting than the bluegrass. Conversely, a seed as small as bentgrass (about ¼ the size of Kentucky bluegrass) should be planted on the soil surface. When the soil surface is not even, it is very difficult to control depth of planting. The net result is a variable or uneven stand of turfgrass because of the variance in seed depth.

Furthermore, lifting sod from areas which are pocketed with undulations becomes very difficult. In situations when the normally used tillage implements are inadequate for preparing a level even seedbed, land levelers can be used to advantage.

Incorporation of organic materials in the form of green manure cover crops, well in advance of the anticipated time of planting, can improve very light or heavy-textured soils. Dense plantings of such crops as corn, sorghum or soybeans make suitable cover crops.

Seedbeds should be prepared well in advance of the seeding date with periodic, shallow tillage. This is an opportunity to destroy several crops of weeds before planting.

Chemical preparation involves adjustment of soil pH to approximately 6.5 (slightly acidic) with adequate amounts of lime. The amount of lime required will depend upon the degree of acidity as well as the soil type. A soil test is the best way to determine the amount of lime required for a particular soil.

Adequate Fertilization A Must

Adequate fertilization is necessary to get new turfgrass seedlings off to a vigorous start. A 1:1:1 (N:P:K) ratio of fertilizer applied at the rate to provide about 100 lbs. of actual nitrogen/acre is satisfactory for most situations. If soil test information is available which indicates very low levels of phosphorus and/or potash, a 1:2:2 or 1:2:1 fertilizer at equivalent rate of nitrogen (100 lbs./A.) to the 1:1:1 would be more appropriate. In situations where the phosphorus and potash are above average, a 2:1:1 fertilizer ratio (100:50:50 lbs./A.) or straight nitrogen material, applied at rates equivalent to the nitrogen rate suggested in the 1:1:1 ratio, would be adequate.

In some situations grubs and

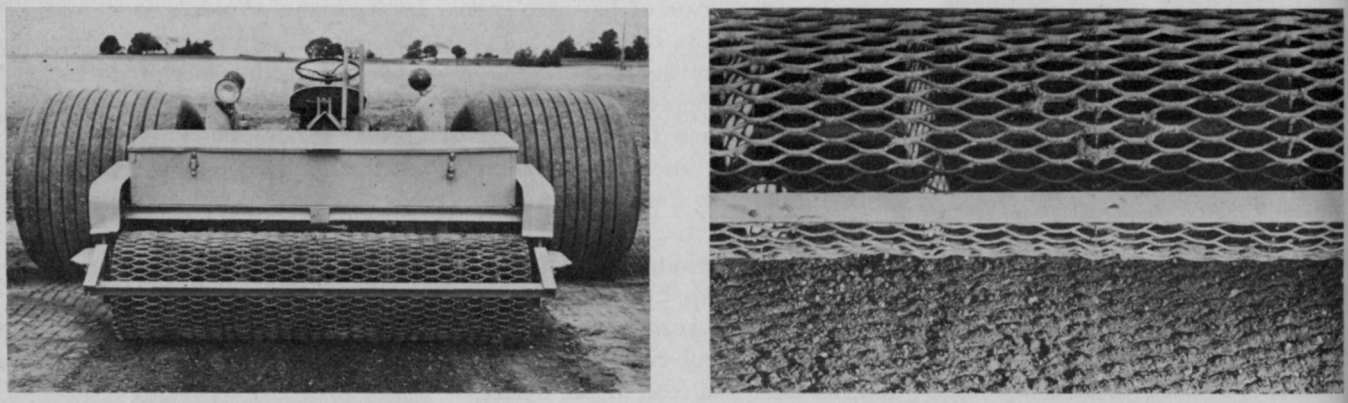

Figure 3. View of one type of seeder in popular use, together with a close-up view of the soil conditions after seeding.