Do your sand traps look more like the Sahara Desert?

If they do, then you need the Smithco Super Rake,™ the most advanced sand trap raking system on the market today.

The Super Rake features an exclusive adjustable hydraulic floating rake which actually follows the trap contours resulting in a perfectly raked trap everytime.

The Super Rake has a *3-wheel drive system with hydraulic motors on each wheel.* So you get all the power you need. And the unique attachments make sure you have the equipment you need to get every job done quickly, efficiently and economically. Attachments like an *independent cultivator, disc edger, front mounted plow* and *drag mat.* And for golf courses with less severe traps, the Smithco Easy Rider is an effective mechanical drive rake at an economical price. *Exclusive 2-year warranty.* No one offers a 2-year warranty except Smithco and DeBRA. It's just one more reason why you should consider the Smithco Super Rake.

So don't get trapped by inferior sand trap equipment. Get the Smithco Super Rake. And smooth out your wild deserts.

DeBRA Turf & Industrial Equipment Company

Ft. Lauderdale, FL
901 N.W. 31st Ave.
33311
(305) 792-6005

Tampa, FL
6025 U.S. Hwy. 301
33610
(813) 621-3077

Ft. Myers, FL
12090 Metro Parkway
33912
(813) 768-3188

Stuart, FL
3913 Bruner Terr.
33497
(305) 288-4838

Sarasota, FL
510 Cattlemen Rd.
34232
(813) 377-5081

Orlando, FL
3418 N. Orange Blossom Trail
32084
(305) 291-8323
1-800-368-8873

Jacksonville, FL
6123-5 Phillips Hwy.
32207
(904) 733-3115

CAN BENT GRASS BEAT THE HEAT?

Jeffrey V. Krans
Professor of Agronomy
Mississippi State University

Creeping bentgrass is unquestionably an important turfgrass species used on golf greens throughout the U.S. However, its zone of adaptation is limited by its own physiology; it is a cool season plant type. Research at Mississippi State University shows that its thermal physiological limit (TPL) (tolerance to high temperature) is 127°F. This critical temperature can be compared to bermudagrass which shows its TPL is 150°F. Although bentgrass could not attain the same TPL as bermudagrass, research has shown that the 127° TPL of creeping bentgrass can be extended. To what degree this expansion can be made is not yet known. However, the important point is that the genetic diversity does exist for improvements.

Over the past ten years, we have been conducting research at Mississippi State University to develop an improved creeping bentgrass. Our goal is to release a seeded bentgrass cultivar with improved tolerance to direct high temperature stress. As a means to achieve this goal, research has been based on tissue culture techniques. Briefly stated, tissue culture is the culture or maintenance of plants at an unorganized cellular level (Fig. 1). This approach differs from conventional plant breeding in that tissue culture is based at the cell level, whereas, traditional plant breeding utilizes plants at the whole plant level. Tissue culture takes place in sterile containers, usually a petri dish containing various growth substances and nutrients that support plant (cell) growth. Changing one or more components in the tissue culture media affects the degree of growth and differentiation of the cells and therefore gives this process its uniqueness (Fig. 2).

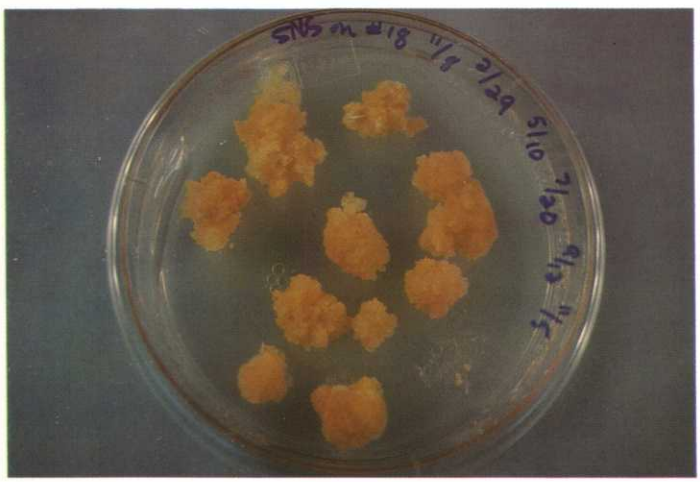


Fig. 1 Tissue culture of creeping bentgrass growing as organized aggregates of cells called callus. It is at this stage of culture that superior cell lines are recovered using a process called **in vitro** cell selection.

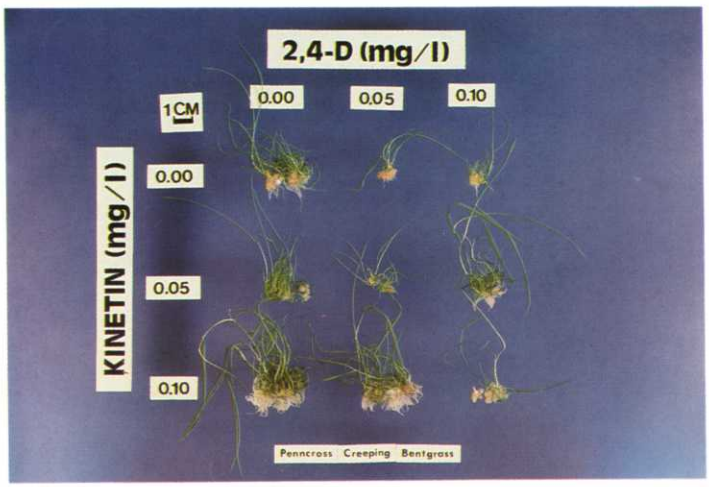


Fig. 2 By varying the concentrations of two plant growth regulators (Kinetic and 2, 4-D), the degree of root and shoot formation can be made to vary. It is this regeneration ability that allows for the recovery of superior plants from previously selected superior cell lines.

By subjecting large numbers of creeping bentgrass cells to normally lethal levels of extreme high temperatures, tolerant cell lines have been isolated and whole plants regenerated with survival features. Currently, we have recovered and field tested over 500 superior types of creeping bentgrass. Of this group, 8-10 variants have been selected as the best survivors. Since 1985, we have been sending these superior plants to Oregon for seed production. This fall

(continued on page 14)

MOWING SLOPES DOESN'T HAVE TO BE AN UPHILL BATTLE.

The Jacobsen Tri-King 1471 is king of the hill with exclusive 3-wheel drive.

No other triplex mower flattens hills like the Jacobsen Tri-King 1471. No-slip direct-drive traction pump and optional 3-wheel drive take you to the top while other mowers are spinning their wheels. And with automotive-type drum brakes, no one lets you hold your ground better.

With the Tri-King 1471 you get both high performance and the legendary Jacobsen quality cut. Pick either 5- or 10-blade reels to match your mowing needs. Use them in fixed position for higher cutting, or floating position to hug contours and eliminate scalping. Time-saving on-machine backlapping is another Jacobsen advantage.

Operators will like the foot-controlled hydraulic lift with automatic reel shutoff; and positive aircraft-yoke-type steering. Together, they deliver the fastest, most convenient lift, turn and mow capacity of any triplex. Plus, rubber-cushioned isolation mounting of the engine reduces vibration and noise for better operator comfort.

The Tri-King 1471 is also tops in serviceability. Interchangeable reel drive belts make replacement easy without tools. Ducted air flow keeps the engine clean and cool. And the efficient drive system design eliminates constant adjustment and replacement of drive belts.

Stay on top of your mowing schedule with a Jacobsen Tri-King 1471. See your Jacobsen distributor today. Attractive lease and financing plans available. Jacobsen Division of Textron Inc., Racine, WI 53403.

JACOBSEN
TEXTRON

Jacobsen Division of Textron Inc.

J-7-8

DeBRA Turf & Industrial Equipment Company

Ft. Lauderdale, FL
901 N.W. 31st Ave.
33311
(305) 792-6005

Tampa, FL
6025 U.S. Hwy. 301
33610
(813) 621-3077

Ft. Myers, FL
12090 Metro Parkway
33912
(813) 768-3188

Stuart, FL
3913 Bruner Terr.
33497
(305) 288-4838

Sarasota, FL
510 Cattlemen Rd.
34232
(813) 377-5081

Orlando, FL
3418 N. Orange Blossom Trail
32084
(305) 291-8323
1-800-368-8873

Jacksonville, FL
6123-5 Phillips Hwy.
32207
(904) 733-3115

(continued from page 12)

we planted our first experimental cultivar (MSX-68) (Fig. 3) and are looking forward to next summer and high temperature stress. Based on recent tests conducted on the parents used in seed production, results show physiological evidence that we have increased the heat tolerance in creeping bentgrass. How much and to degree this has been sexually transmitted to the progeny (seed) will be determined during the next two summers. Bentgrass will never have the heat tolerance of bermudagrass. However, we now know that we can improve this species and make it more heat tolerant. To answer the question: "Can bentgrass beat the heat?" we are sure it has good promise, but how good is "good" is still unknown. With continued research, the full answer to this question will become more apparent.

Fig. 3 Initial establishment (3 weeks post-germination) of the first experimental heat tolerant cultivar in comparison to Penncross and Pennlinks creeping bentgrass. This experimental putting surface will be used to evaluate relative heat tolerance of these cultivars.

Acknowledgements: Our creeping bentgrass heat tolerance research has been funded in part by the Carolina Golf Association, Georgia Golf Course Superintendents Association and the United States Golf Association.

Editor's Note:

Jeff Krans, Ph.D., has been teaching Turfgrass Management at Mississippi State University for the past 15 years. He earned his Ph.D. from Michigan State University. His current research is on plant breeding activity in heat tolerance of creeping bentgrass.

When it comes to purchasing golf course maintenance equipment...

"Don't be penny wise and pound foolish."

We do it all our lives. Cut corners for the sake of cost. It's a common mistake. One we all make. And doing so is almost always foolish.

But the one place you should never consider cutting corners is when purchasing golf course maintenance equipment. Why? Because keeping your golf course maintained and well manicured is your job... your livelihood. Don't jeopardize it trying to save a few bucks up front on the equipment you purchase. Because the equipment is just as important as the course it helps to maintain. If the equipment is less than perfect, then the results will be less than perfect.

That's where DeBRA comes in.

DeBRA is the most trusted and relied upon name for turf and industrial equipment you'll find anywhere. People across Florida have relied on DeBRA's dependability for close to 30 years. But the service doesn't stop after the sale. We have over $1 million in parts inventory at all times. So you know we have what you need when you need it. Including service on-the-job.

You know the name DeBRA. Now get to know the company.

DeBRA Turf & Industrial Equipment Company

Ft. Lauderdale, FL
901 N.W. 31st Ave.
33311
(305) 792-6005

Tampa, FL
6025 U.S. Hwy. 301
33610
(813) 621-3077

Ft. Myers, FL
12090 Metro Parkway
33912
(813) 768-3188

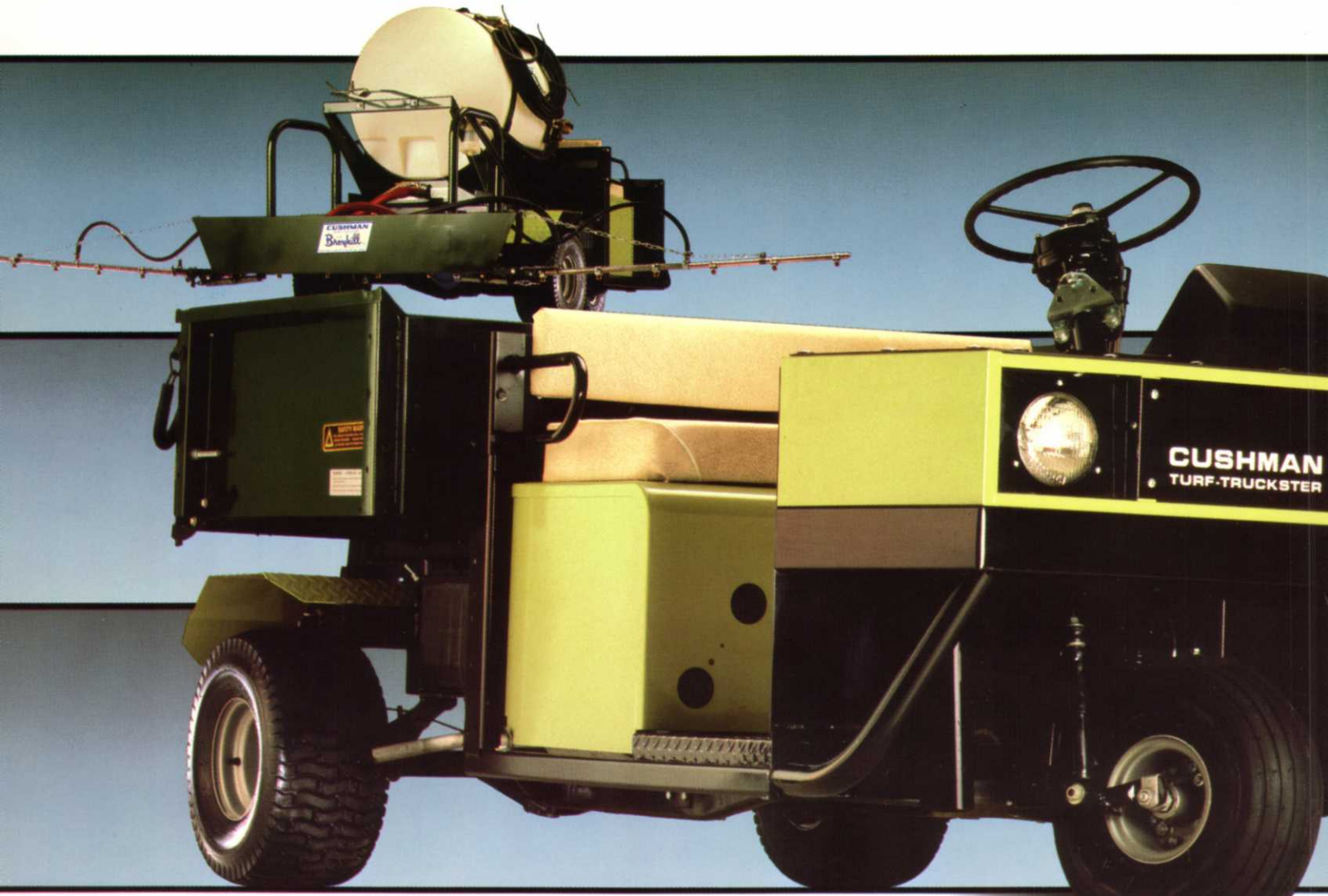
Stuart, FL
3913 Bruner Terr.
33497
(305) 288-4838

Sarasota, FL
510 Cattlemen Rd.
34232
(813) 377-5081

Orlando, FL
3418 N. Orange Blossom Trail
32084
(305) 291-8323
1-800-368-8873

Jacksonville, FL
6123-5 Phillips Hwy.
32207
(904) 733-3115

Built like a truck… works like a fleet.

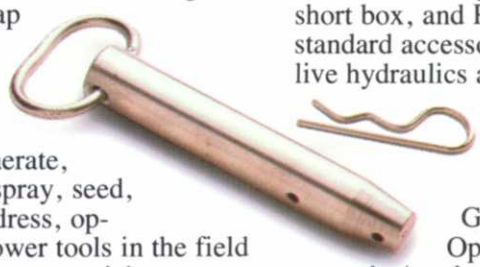


The Cushman Turf-Truckster® is your key to cost-efficient turf care.

You get more mileage out of a Cushman Turf-Truckster because it's not only built to go the distance, it's designed to do more jobs, and do them better. Because no other turf vehicle gives you the rugged versatility of Cushman's exclusive pin-disconnect system.

The pin-disconnect system puts it all together.

The industry's largest selection of hard-working turf care attachments can be changed on the Truckster in just minutes. No bolting. No tools. Just snap in two or three pins, and you're ready to go.



You can aerate, haul, dump, spray, seed, fertilize, top dress, operate small power tools in the field — now you can even pick up cores. You'll save time, stretch your budget, and give your turf the finest care possible.

Bar set, drag mat, flatbed box, short box, and Power Converter are standard accessories. Add optional live hydraulics and you can add shortbox dumping, flatbed box dumping, the Quick Aerator, and the Greensaver Aerator. Optional PTO for the spreader/seeder, Vicon Spreader, Cushman Top Dresser, 100 or 150-Gallon sprayers, hand gun and

boom completes your single-vehicle work fleet — almost.

Introducing the new Cushman Core Harvester.™

The newest addition to the Cushman Turf-Truckster fleet saves time and cuts labor 75% on greens aeration. Because with live hydraulics and the new Cushman Core Harvester accessory, one person can do the work of four.

The Cushman Core Harvester glides gently over the green to scoop up cores left from walk-behind aerators. So, you can free up your grounds crew for other jobs, and get golfers back into play faster than ever before.

More years of heavy use.

With all the work your Truckster will do, it's got to be tough. And it is. The Truckster's rugged, carbon-steel channel frame and heavy-duty suspension are designed to withstand years of pounding under a 1,900-lb. maximum load. Cushman's work-proven, easy-maintenance 22-hp. gas engine has plenty of stamina to pull tough loads over the long run.

A lesser turf vehicle simply won't do if you're tackling tough turf maintenance jobs thousands of hours a year, year in and year out.

For more information or a free demonstration of what the Cushman Turf-Truckster can do for you, contact the Cushman dealer nearest you today. Or call toll-free: 1-800-228-4444.

CUSHMAN®

BUILT TO LAST

5348 Cushman, OMC-Lincoln, P.O. Box 82409, Lincoln, NE 68501

EASY ON HIGH-POWER NITROGEN

By O.J. Noer

GOLF CLUBS in the South are confronted with turf maintenance problems which are peculiar to that section. These are accentuated in Florida, where the preponderance of light sandy soils account for plant food deficiencies not encountered in other sections. Heavy annual precipitation and porous sandy soil results in rapid loss of plant food by leaching. Favorable air temperatures and abundant rainfall produce luxuriant vegetation, but this advantage is partially offset by the greater variety and abundance of insect pests.

Nowhere are insects a more serious threat than in Florida. The greener grass on golf courses attract these pests from adjoining waste lands with almost devastating results. Their control is a problem deserving of special attention to simplify and safeguard turf maintenance, but that concerns the entomologist, and is beyond the scope of the present discussion.

It is universal practice to use Bermuda as the basal grass on southern greens. This constitutes the putting surface for summer usage, but it is accepted practice to seed rye or other suitable grass for winter play. Bermuda is also the principal fairway grass, although carpet grass is favored by many particularly on the moister low-lying areas. It is said that where conditions are favorable for its growth, carpet grass will crowd out many objectionable weeds.

BERMUDA DORMANT IN WINTER

In Southern Florida, Bermuda continues growth throughout the winter, but from central Florida north it turns brown in the late fall, and remains dormant throughout the winter season. Due to this climatic difference, courses in south Florida can maintain green fairways throughout the important winter season, and several courses south of Palm Beach have continued with Bermuda greens without resorting to supplementary seedings of winter grass. Whether the prejudices against Bermuda can be overcome only time will tell.

The customary fall seeding does not interfere with play on courses open during the winter only, but where play continues throughout the year, surfaces are poor for a period in the fall until the new grass becomes established, and for an even longer period in the spring, extending from the time winter grass starts to disappear until the Bermuda reestablishes itself.

Golfers accustomed to the bent greens of the North object to Bermuda greens because it develops stubbly hard surface stems and coarse broad leaves. This is not so noticeable on new turf developed from seed, but even this turf gradually becomes coarse.

To overcome these objections, there has been considerable agitation lately in favor of bent to provide grass for all year play. Its successful use in southern California and western Kansas are cited as proof that it will survive far south of the present limits. Unquestionably, bent will grow in the southeastern states during the winter, but it is not apt to withstand severe summer weather.

Southern California has a hot dry climate, and this is also true of western Kansas during the summer. Consequently, grass is free from dew during the most difficult summer season, and the supply of water can be controlled absolutely by artificial means. In the southwestern states, bent is apt to go out quickly during humid hot weather following heavy rains. Even partial success must depend upon exceptional surface drainage to remove surplus water rapidly, and a soil sufficiently porous to accelerate downward movement of any superluous water absorbed by the soil.

DOUBTS BENT'S SUCCESS IN SOUTH

Careful watering, correct feeding, and constant control of fungous diseases and insect pests obviously are also very essential. Even the best of care may fail during an unusually wet, hot summer. The abominable surfaces following even partial loss of bent turf and probable high cost of maintenance will deter general use of bent in the South. Bermuda has no equal as a hot weather grass, and for the present will continue as the most suitable grass for summer play. Search for finer-leaved strains and better methods of maintenance offers more promise for better summer putting surfaces than general adoption of bent. Two sets of greens, one for summer and the other for winter play is one solution for inconveniences incident to fall seeding and Bermuda revival in the spring.

(continued on page 20)

They can't blame you for bad putts. Not when you control your *Poa annua* with Rubigan. When used in a preemergence program applied in the late summer and early fall, Rubigan delivers 75-95% *Poa* control, without affecting your ryegrass seed germination.

Rubigan also controls dollar spot and large brown patch. Roots and leaves quickly absorb Rubigan, and once the spray dries, it won't wash off. Plus, with Rubigan, your resistance worries are limited due to multi-sites of inhibition.

Rubigan's safety to Bermudagrass turf tops off the list of reasons why you should be using Rubigan in your *Poa* control program.

So when *Poa* roughs up your course and ruins your golfer's putts, pull out your Rubigan, and put an end to their *Poa* excuse. See your Elanco distributor. Or call toll-free: **1-800-352-6776.**

Elanco Products Company
A Division of Eli Lilly and Company
Lilly Corporate Center
Dept. E-455, Indianapolis, IN 46285, U.S.A.
Rubigan®—(fenarimol, Elanco)

Rubigan® ends your golfer's Poa excuse.

(continued from page 18)

WHEN TO SEED WINTER GRASS

Winter grass is seeded when temperatures are moderate-during October in the Carolinas, and late in November in Florida. Prior to seeding, the greens are raked thoroughly and cut close. This removes many superfluous runners, and serves to prepare a seed bed for the young seedings. Fertilizer is then applied, seed is sowed and covered with a moderate topdressing. The soil is kept moist by frequent watering to promote germination and obtain a stand of grass quickly. Once a good stand of well-rooted grass is obtained, few difficulties confront subsequent maintenance.

The most serious trouble occurs during the first few weeks following seeding. New leaf growth is often soft and tender, but with age, leaf structures tend to become more sturdy. If hot humid weather follows seeding and leaf structures are especially succulent, the young grass succumbs. In extreme cases reseeding becomes necessary. The affiction resembles the "damping off" which occurs in the greenhouse in the winter when grasses are grown for experimental purposes. Greenhouse temperatures of 80° Fahrenheit or more, and heavy watering usually induce a "damping off" of new seedings. It can be prevented by maintaining temperatures approximating 60° F., watering carefully, and avoiding excessive initial nitrogen feeding.

Obviously, outdoor temperatures cannot be controlled, so the only hope of minimizing trouble lies in cultural methods which tend to produce a sturdier initial growth. Practices which promote early root development and production of sturdier leaves will surely lessen the severity of injury, and make control possible.

Failure to recognize and apply these fundamental underlying principles are in a measure responsible for the troubles immediately following seeding.

Methods followed during the summer are not suitable for winter grass. Bermuda must be kept vegetative to offset its tendency to mature, and thus produce stiff leaves and stubby stems. This necessitates generous watering and heavier nitrogen feeding with only sufficient phosphoric acid and potash to satisfy growth requirements.

GO EASY ON NITROGEN

In many instances the fertilizers used before seeding have aggravated troubles. The tendency has been to use nitrogen, which is the growth producing element, too generously. Rapid growth, no matter how produced, is always associated with more tender leaf structures; so nitrogen by forcing initial growth unduly may accentuate the young seedlings' natural tendency to produce weak leaves. On new seedings phosphoric acid excites a marked stimulating effect on initial root development, and potash tends to produce somewhat sturdier leaves. Hence, it would seem logical to withhold nitrogen prior to seeding, and confine fertilization to applications of phosphoric acid, and possibly potash on the sandier soils. After a good root system is obtained, nitrogen feeding can begin, and its use continued throughout the playing season as turf condition warrants.

Generous use of nitrogen on Bermuda in early fall should be avoided, for residual nitrogen in the soil may force the new seedings. This danger can be overcome by having the Bermuda just a little nitrogen hungry at the time of seeding.

Water plays a very important role in its effect upon amount and character of growth. In the presence of a limited moisture supply, growth is restricted and tissues become harder. Where water is plentiful, rapid growth occurs and plant tissues are softer. These effects are often overlooked, and the possibilities of influencing the amount and character of growth by partial control of the water supply is seldom considered.

Proportionately more water is used on Bermuda greens than is customary on bent greens in the North. This is undoubtedly, sound practice, provided excesses which saturate the soil are avoided, because it encourages more active vegetative growth. On winter grass a minimum of water, just sufficient to satisfy growth requirements, will tend to produce stronger turf.

THIS PROGRAM SUCCEEDED IN 1930

For those who desire a concrete example, the program followed by several greenkeepers in Florida last fall may be of interest. Whether it deserves general adoption and will prove equally successful during a severe season remains to be seen.

Fertilizer applications consisted of 2 to 4 lbs. of 45 per cent super-phosphate (4 to 10 lbs. of 16 or 20 per cent phosphate) and 2 to 3 lbs. of 50 per cent muriate of potash per 1,000 sq. ft. of surface. Applications were made 7 to 10 days prior to seeding to avoid all danger of retarding germination, or injury to the young seedling. No nitrogen was used, and fall feeding of Bermuda was previously curtailed.

After seeding, the greens were topdressed with a soil devoid of plant food. It consisted of a mixture of marl and sand in proportions such as to make a good sandy loam. Humus, muck, peat, and rich compost were purposely omitted from this one topdressing mixture. Watering was watched closely. Just enough to permit growth was supplied, and excesses avoided. An excellent stand of grass was obtained, and nitrogen feeding was not started until a good root system had developed. Nitrogen feeding was continued during the playing season, frequency and rate of application depended upon turf condition, using color, amount of growth, and sturdiness as a guide.

EDITOR'S NOTE: This article was taken from the October 1931 issue of Golfdom Magazine. It could just as easily apply to the bentgrass controversy in Florida today. ■