TURFAX™

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CONTENTS:

SEEDED BERMUDAGRASS CULTIVAR LOW TEMPERATURE HARDINESS

Dr. Jeff Krans, Turfgrass Researcher at Mississippi State University, established a study encompassing the newer seeded bermudagrass (*Cynodon* spp.) cultivars in a fairway-sport field type assessment. Also included was a reference cultivar, Tifway, which was vegetatively established. He reports that during the winter of 1995-96 all the newer seeded bermudagrass cultivars were seriously damaged by low temperature kill, with the exception of Guymon. In contrast, the vegetatively propagated Tifway was not injured. Evidently a majority of the germplasm sources used in developing turf-type cultivars possessing the ability to produce viable seed in reasonable quantities also are characterized by a lack of low temperature hardiness. This raises a red flag concerning the use of these newer seeded bermudagrass cultivars in areas where low temperature kill occurs.

POA TRIVIALIS - A WEED?

During visits to golf courses and sports fields in Europe, I am frequently asked the following question. How does one get rid of the yellow patches in the perennial ryegrass (*Lolium perenne*) - Kentucky bluegrass (*Poa pratensis*) fairways and sports fields?

Examination of the yellowish patches reveals the presence of *Poa trivialis* which also is known by the common name rough bluegrass, and as roughstalk bluegrass in the United Kingdom.

Poa trivialis is characterized by a very yellow natural leaf coloration and extensive stoloniferous lateral stems. This results in a distinct, dense, patchy growth in monostands where other grasses tend to be absent. *Poa trivialis* is very prone to heat and drought stresses, but has the weedy ability to recover in persistent, scattered patches.

There is no chemical labeled for the selective removal of *Poa trivialis* from other perennial turfgrass species.

There is the possibility that the source of these *Poa trivialis* patches was present in the seed originally purchased. The patches do develop relatively quickly after planting. Accordingly, it is advisable when purchasing perennial ryegrass and Kentucky bluegrass seed for quality turf areas to include in the specifications a statement that <u>the seed lot or mixture shall be free of *Poa trivialis*</u>.

Note: *Poa trivialis* is used as a desirable turfgrass species for wet, shaded areas in cool climates and for winter overseeding of dormant warm-season turfgrass species.

JB COMMENTS - EARTHWORM HAPPENINGS!

Other than rabbits, earthworms (genus *Lumbricus*) were one of the earliest serious pests on golf course turfs in the United Kingdom for several centuries. Consequently, golf was principally a game played on the seaside linksland of Scotland. Attempts to construct golf courses on what was termed "upland" or clay soil resulted in a serious problem with earthworms, that occurred primarily on the putting greens during the mild winters. Because of the disruption of the surface by earthworms, upland golf courses would be unplayable for more than six months out of a year. Also, the amount of soil pushed up causes difficulty in mowing and rolling.

The first successful toxicants for earthworms started to be used in the late 1800's. Irritants were subsequently developed, such as mowery meal - a bean extract from India. The irritant forced the earthworms to the surface where they were raked into piles and physically removed from the putting greens in wheelbarrows.

These initial materials were a key breakthrough, in that they facilitated course construction and year-round play on golf courses in the upland clay areas of England and Scotland. Additional control materials were subsequently developed, and therefore earthworms have not been a significant problem on putting greens for most of the 20th Century.

However, this situation could change because the environmental quality agency in the United Kingdom has essentially eliminated the use of all effective materials utilized in earthworm control, including the irritants. Thus, it appears they may have come full circle back, with the earthworm again becoming a serious major pest problem disrupting play on golf courses in the United Kingdom. Hopefully, a new method can be found to prevent earthworm activity from disrupting the surface quality of putting greens.

UPCOMING JB VISITATIONS:

July 7 to 12 - Ohio.
July 17 to 19 - Vancouver, British Columbia.
July 26 to 31 - Ireland.
September 8 to 12 - New York.

NEW PUBLICATION AVAILABLE:

65th Annual Michigan Turfgrass Conference Proceedings. Volume 24. 278 pages. Michigan State University Extension. (1995).

The publication contains 52 papers presented before the Michigan Turfgrass Conference in 1995. It is organized in five subject areas of: MSU Research Reports, Environmental Issues, Golf, Lawn Care, and Athletic Field. The articles focus on cool-season turfgrasses and conditions.

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The goal of the six issue per year TURFAX™ newsletter is to provide international turf specialists with a network for current information about turf. This newsletter is faxed to all Institute Affiliates that use the ISTI technical assistance services on an annual basis. Faxing is more costly, but ensures quick delivery to those outside the United States.

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JB VISITATIONS:

March-Connecticut.

Presented a Basic Turfgrass Botany and Physiology Seminar along with Dr. Jeff Krans before a group of New England golf course superintendents. This seminar was under sponsorship of the GCSAA. One of the key topics of interest was the types and causes of winterkill and their prevention. As it turned out, winterkill was a scattered problem around the United States extending all the way into north Texas where both Tifdwarf and Tifgreen bermudagrasses grow on closely-mowed putting greens were injured.

May-England.

Three weeks in May were devoted to a literature search in the key libraries around England. This effort was focused on some missing historical dimensions needed to a complete a book entitled **The History of Golf, Sport, and Lawn Turfs**. The libraries included the Lindley Library of the Royal Horticultural Society, Kew Botanical Gardens Library, National Playing Fields Association Library, Football Association Library, and the Victoria and Albert Museum Library; plus visitations to the University of Cambridge, the Institute of Groundsmanship Library in Wolverton, and the Sports Turf Research Institute Library in Bingley.

Unusually cold weather conditions were experienced throughout May in England, similar to most of the United States, with new leaf initiation on trees being 3 to 4 weeks late.

The UK normally is a relatively mild climate with frequent, light rains. However, in 1995 much of the country experienced a severe drought with water rationing being experienced in northwestern England. In some of these locations, such as Lancaster, water rationing has continued throughout the winter period. Due to the very favorable precipitation distribution patterns of the UK, irrigation is not practiced as extensively as in other parts of the world. However, this changed drastically during the summer of 1995. The most striking problem experienced by groundsmen was the lack of uniformity in water distribution from their existing irrigation systems.

June-Italy

A week was spent in Italy including seminar presentations before a golf group in Milan and a groundsman-parks-sport field group in the Rome area. The latter was the first organized seminar effort before this particular segment of the turfgrass industry in Italy.

A visitation was made to the Italian Golf Federation Bentgrass Cultivar Assessment Study plots in Torino, Italy. The new Penn series of bentgrass cultivars continue to perform quite well in terms of shoot density and turf quality under a very close mowing height, with Penn A-1 and Penn G-2 being particularly notable. As this research progresses in the fourth year certain cultivars, such as SR1020, are declining in quality in terms of a reduced shoot density and increased *Poa annua* and moss content. In contrast, Penncross is improving in overall turfgrass quality compared to the first two years. In terms of the assessment of bentgrass cultivars at the very close cutting heights typically used on putting greens, this is the most representative study now being conducted in Europe.

A site visitation assessment also was made to the Fairway-Sports Field Cultivar Assessment Study just west of Roma on a sandy-soil site. A full range of warm-season turfgrass cultivars have now been planted, including both seeded and vegetative types of bermudagrass (*Cynodon* spp.) and zoysiagrass (*Zoysia* spp.), plus a select group St. Augustinegrass (*Stenotaphrum secundatum*), seashore paspalum (*Paspalum vaginatum*), and buffalograss (*Buchloe dactyloides*) cultivars. Particular emphasis is being placed on the warm-season grasses for the southern part of Italy where water limitations are a persistent problem and water conservation should be a priority for turfgrass areas.

One set each of perennial ryegrass (*Lolium perenne*) and tall fescue (*Festuca arundinacea*) cultivar plots will be seeded on an adjacent plot area in the fall.

This project is a cooperative effort involving the Italian Golf Federation, Bindi Nurseries, the University of Pisa Agronomy Department, and the International Sports Turf Institute.

COMPARATIVE GROWTH AND MORPHOLOGY RESPONSES OF EIGHT BENTGRASS GENOTYPES FOLLOWING EXTRAORDINARY HEAT STRESS

by
S.I. Sifers and J.B Beard

Creeping bentgrass (*Agrostis stolonifera* var. *stolonifera*) provides a premier surface for putting and bowling greens. The increased usage of creeping bentgrass outside the cool-season turfgrass adaptation range has created a demand for cultivars with more heat-stress resistance for use in these less than optimum temperature-humidity zones. A number of new cultivars have been released, in the past few years, or are near-release, . Unfortunately, there are few field research facilities that adequately assess these cool-season turfgrasses for adaptation to warm-humid climates when maintained as modern, closely- mowed, fast putting green turfs.

There is a continuing need to conduct comparative field assessments of the shoot and root morphological characteristics of existing genotypes with those of recently-released, near-release, and experimental genotypes in order to determine if there are improvements or reductions in any of the assessed botanical parameters. Too often the developer of a cultivar makes general statements about the morphological characteristics, but published data documenting these responses are not available.

The purpose of this study was to conduct comparative morphological assessments of (a) 5 two-year-old bentgrass genotypes on the greens of the Golf School at the Pinehurst Resort and Country Club (PRC), Pinehurst, N.C. and (b) 4 two-year-old bentgrass genotypes in the test area at The Country Club of North Carolina (CCNC), Pinehurst, N.C. after an extended summer period of severe heat stress.

MATERIALS AND METHODS

Seeding or sodding dates, traffic intensity, mower height setting, and root zone composition data were obtained from the golf course superintendents.

Nine comparative morphological assessments were conducted from 19 to 21 October 1995. Each assessment was conducted with four replications.

- Visual turfgrass quality estimates were based on a composite of two main components: (a) uniformity of appearance and (b) shoot density. The rating scale used was 9 = best and 1 = poorest. A rating of 5.5 or above represented acceptable turfgrass quality for putting greens.
- Color determinations were made using The Royal Horticultural Society (RHS) Colour Charts.
- Shoot density counts were made from 1.3 square inch turfed plugs. Each plug was washed and the shoots separated for counting.
- Shoot height, thatch depth, and mat depth, as well as the length of the longest intact root, were measured with a metric rule.
- The shoot\thatch\mat biomass was harvested, washed, dried for 24 hours at 105C, and then weighed.
- Profile root biomass distribution was determined by washing the root biomass, separating into 2 inch (50 mm) segments, drying at 105C for 24 hours, and then weighing. The total root biomass was the weight of all roots from each plug.

Statistical data from this study were analyzed using the LSD t Test at the 5 % level.

RESULTS AND DISCUSSION

Assessments at 3 mm Cutting Height

Comparative assessment data for the bentgrass cultivars maintained at a 3 mm height of cut are presented in Table 1 for color and turfgrass visual quality, in Table 2 for shoot parameters, and in Table 3 for root assessments. The 3 mm mowing height is typical of the heights used on high quality, creeping bentgrass putting greens to obtain the desired ball speed. Unfortunately, these heights also impose a very severe stress on the turfgrass, especially during the hot-humid stress period, when bentgrass growth is minimal.

<u>Visual Turfgrass Quality</u>: The lowest quality of 4.5 occurred with Cato and Pennlinks which were not uniform in appearance or density. The other turf that rated below acceptable was Crenshaw. All other cultivars were acceptable or higher.

Table 1. Comparative genotype assessments of color and turfgrass quality after an extraordinarily hot humid summer.

Assessment location	Bentgrass genotype	RHS Color	Visual turfgrass quality*
Pinehurst Resort and C.C. (3 mm)	Penn G-2	yellow-green	5.9
	Penn A-1	yellow-green	5.8
	Crenshaw	yellow-green	5.3
	Pennlinks	yellow-green	4.5
	Cato	green	4.5
The Country Club of North Carolina (6 mm)	Putter	light-green	6.6
	SR1020	green	6.0
	Providence	green	6.0
	Cato	green	5.5

*Visual turfgrass quality with 9-best possible and 1-poorest.

Shoot Density. The shoot density ranged from a high of 2,888 for Penn G-2 to a low of 738 for Cato. A high shoot density also was found for Penn A-1.

Table 2. Comparative assessments of shoot height, mat depth, shoot\mat dry weight, and shoot density for five creeping bentgrass genotypes. The assessment dates were October 19-21 , 1995 after an extraordinarily hot-humid summer season.

Bentgrass genotype	Shoot height (mm)	Mat depth (mm)	Shoot \mat biomass (g dry wt./ sq. dm)	Shoot density count (sq. dm)
Penn G-2	3	15 a	79 a	2,888 a
Penn A-1	3.5	12 b	78 a	2,601 b
Pennlinks	3	14 ab	43 bc	1,840 c
Crenshaw	3.3	9 c	38 c	1,482 d
Cato*	3.0/7.0	7 d	46 bc	738 e

Means followed by the same letter in the same column are not significantly different at the 5 % level LSD t-Test.
* All turfs were mowed at 3 mm, however the Cato height of cut was raised to 6 mm in mid-September of 1995 to slow an excessive loss of stand.

Shoot\Mat Biomass. Penn G-2 and Penn A-1 had the highest biomass, while Crenshaw ranked the lowest. The Cato was being mowed 4 mm higher than for the other genotypes, which would contribute to a higher relative ranking than would have been observed otherwise.

Mat Depth. Penn G-2, Pennlinks, and Penn A-1 had the thickest mat depths, with Cato and Crenshaw having the least. These differentials reflect the shoot density counts. There was no significant thatch present on any of the cultivar plots.

Root Biomass. The root biomass is expressed as the weight of dry roots in grams per surface square decimeter. Three profile depths were assessed: 0 to 2 inches, 2 to 4 inches, and 4 to 6 inches. There were no roots below this lowest depth.

0 to 2 inches. Most of the roots were in the upper 2 inches (50 mm) of the soil profile after the extraordinarily hot summer. Penn A-1 and Penn G-2 exhibited the most root biomass. Crenshaw and Cato had poor rooting, while Pennlinks ranked intermediate.

2 to 4 inches. Four of the cultivars had a similar measurable root biomass at this depth, while Cato had no roots below 2 inches (50 mm).

4 to 6 inches. All turfs had minimal roots at this depth. Crenshaw had no roots below 4 inches (100 mm).

Table 3. Comparative assessments of the length of the longest intact root, root biomass for 0 to 2 inch, 2 to 4 inch, 4 to 6 inch depths, and total root biomass for five creeping bentgrass genotypes. The assessment dates were October 19-21 , 1995 after an extraordinarily hot-humid summer season.

Bentgrass genotype	Length longest root (mm)	Root biomass dry wt.(g/sq.dm) 0-2 inches	2 to 4 inches	4 to 6 inches	Total biomass
Penn A-1	107 b	66 ab	0.5 a	0.2 bc	67 a
Penn G-2	122 ab	44 bc	0.7 a	0.6 a	46 a
Pennlinks	137 a	22 cd	0.6 a	0.4 ab	23 bc
Crenshaw	83 c	5 d	0.5 a	0.0 c	6 c
Cato *	43 d	0.4 d	0.0 b	0.0 c	0.4 c

Means followed by the same letter in the same column are not significantly different at the 5 % level LSD t-Test.
*All turfs were mowed at 3 mm, except for the Cato height of cut that was raised to 6 mm in September, 1995 to slow an excessive loss of stand.

Total Root Biomass. Penn A-1 had a significantly higher total root mass after the severe hot summer. Penn G-2 had the second highest total root biomass. Crenshaw and Cato had a very low total root biomass following the extraordinarily high temperatures during the summer of 1995 in Pinehurst, North Carolina.

Length of Longest Intact Root. Pennlinks had the longest root length, with Penn G-2 next best, followed by Penn A-1. The longest root for each of the three was 100 mm or deeper.

Assessments at 6 mm Cutting Height

Comparative assessments of the four genotypes maintained at a 6 mm cutting height are in Table 4 for shoot data and in Table 5 for root responses. This height of cut may be used when environmental conditions are so severe that they threaten loss of the green or when a period of recovery from lower mowing heights is necessary. The putting speed is slower, but plant health and survival potential are enhanced.

Table 4. Comparative assessments of shoot height, mat depth, shoot\mat dry weight, and shoot density counts for four creeping bentgrass genotypes. The assessment dates were October 19 to 21, 1995 after an extraordinarily hot-humid summer season.

Bentgrass genotype	Shoot height (mm)	Mat depth (mm)	Shoot/mat biomass (g dry wt./ sq dm)	Shoot density count (sq dm)
Putter	6 a	7 a	25 b	1,852 a
Providence	6 a	7 a	40 a	1,851 a
SR1020	6 a	8 a	25 b	1,806 a
Cato	7 b	7 a	46 a	738 b

Means followed by the same letter in the same column are not significantly different at the 5 % level LSD t-Test.

Shoot Density. Putter, Providence, and SR 1020, were similar in shoot density following the severe summer heat stress. Cato was very low.

Shoot\Mat Biomass. Providence had a significantly higher shoot and mat biomass. Since there was no difference in shoot density and in mat depth this may indicate a higher individual plant biomass.

Mat Depth. There was no accumulation of thatch, and there were no differences in the mat depths among the four genotypes.

Assessments of older plantings of Penncross nearby both test sites, which were maintained similarly, revealed that Penncross was superior in total root biomass, exceeding 100 gm/dm sq. Is this one of the key reasons for the world-wide adaptation range of Penncross in terms of heat and drought resistance?

Table 5. Comparative assessments of the length of the longest intact root, biomass for 0 to 2 inches, 2 to 4 inches, 4 to 6 inches, and total biomass for four creeping bentgrass genotypes. The assessment dates were October 19 to 21, 1995 after an extraordinarily hot-humid summer season.

Bentgrass genotype	Length longest root (mm)	Root biomass dry wt(grams per sq dm)			
		0 to 2 inches	2 to 4 inches	4 to 6 inches	Total biomass
SR1020	112 a	44 a	1.4 a	0.2 a	46 a
Providence	85 b	27 b	0.8 ab	0.0 b	27 b
Putter	85 b	15 b	1.0 ab	0.0 b	16 b
Cato	43 c	4 c	0.0 b	0.0 b	0.4 c

Means followed by the same letter in the same column are not significantly different at the 5 % level LSD t-Test.

Root Biomass. A long root length contributes to survival in low moisture conditions since the moisture located deeper in the root zone can be accessed by the plant. There were no roots below 5 inches (125 mm).

0 to 2 inch depth. SR1020 had the highest root biomass, with Providence and Putter being intermediate. The Cato root biomass was very poor.

2 to 4 inch depth. The top three genotypes had similar root biomasses. Cato had no roots below 2 inches (50 mm).

4 to 6 inch depth. SR 1020 had the only roots below 4 inches (100 mm).

Total Root Biomass. SR 1020 had a significantly higher total root biomass after the extraordinarily hot summer. Providence and Putter were intermediate, while Cato was very poor in root biomass.

Length of the Longest Intact Root. SR 1020 had the longest root. Providence and Putter were intermediate, while Cato had the shortest individual root length.

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Note. This article has been excerpted from the full paper published as International Sports Turf Institute Research Report No. 204 (1996).