TURFAX™

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CONTENTS

MOSS MANAGEMENT

Moss is a plant in the class Musci within the division Bryophyta. Most of the mosses that develop as problems in turf areas are green in color. This means they are most likely to develop in turfs which have been thinned or damaged to the extent that openings in the turf allow sunlight to reach the surface, whereon the moss initiates growth. The Metropolitan Golf Association of New York funded a study at Cornell University under the direction of Dr. Norman Hummel which focused on methods for the chemical and cultural control of moss in turfgrasses. Dr. Hummel's work showed the following chemical controls to be effective, especially when combined with specific cultural practices.

In early spring, the application of hydrated lime at 2.5 kilograms per 100 square meters (5 lbs/1,000 sq ft) is effective in burning back the moss.

Then approximately a month after the hydrated lime application and also again in the fall, there are several options in terms of pesticides for the control of moss. The most effective treatment Hummel found was the Scotts Crabgrass Killer which contains a combination of bensulide and oxadiazon. The product is labeled for use on putting greens and provided 83% moss control in a single application under the conditions of the study in New York. It was noted however that the treatment did cause some discoloration to the creeping bentgrass (*Agrostis stolonifera* var. *stolonifera*). Other controls that provided from 53 to 74% control of the moss were siduron and bentazon. Both were safer to use than the bensulide and oxadiazon combination. The mode of action of these chemicals was chronic in nature with several weeks passing following application before a significant decrease in the moss population was observed.

Dr. Hummel's studies indicated that chemical control of moss was maximized by key adjustments in the turfgrass cultural practices. Enhancing the shoot density and health of the turfgrass is important. The best contributing cultural practices consisted of core cultivation followed immediately by a sand topdressing to enhance surface drying. Deep spiking also was beneficial when used in combination with core cultivation. These soil management practices were further maximized when combined with high rates of nitrogen (N) and iron (Fe). For example, moss was eliminated over a period of 2 growing seasons on plots that initially contained 40% moss by increasing the nitrogen rate to 0.4

kg/100 m² (0.8 lb/1,000 sq ft) per growing month. In addition, iron applications at a rate of 170 g/100 m² (6 oz/1,000 sq ft) per growing month was beneficial during the first year, but had no effect during the second year.

To summarize, an early spring application of hydrated lime, followed about a month later and in early fall with an effective herbicide are the first steps in controlling moss. By increasing the nitrogen level during this treatment time the competitive advantage of the turfgrasses is further enhanced at the expense of the moss. It also should be recognized that judicious irrigation and maximizing surface and internal drainage in the soil profile are important in providing an environment that is less favorable for moss growth.

NOTE

The ISTI office will move to the winter location in College Station, Texas the week of October 22.

ISTI Chief Scientist: James B Beard
TURFAX™ Production Editor: Harriet J. Beard

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.

For non-affiliates, a TURFAX™ subscription is **available by annual payment of U.S. $60.00.** Payment may be made by sending a check to the address given below. Foreign orders please send a check or money order on a U.S. bank.

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NEW PUBLICATION AVAILABLE

Proceedings of the International Symposium on Soccer Fields. by the Committee of International Symposium on Soccer Fields. Soft Science, Inc., 170 pages. (1994).

This proceedings contains the papers presented by 6 lecturers invited to participate in this international symposium on soccer fields. Topics include the following: (a) Present situation and future trends of world soccer fields with special reference to construction and maintenance problems-by Dr. James R. Watson, (b) The scientific basis for soccer pitch construction and maintenance by-Dr. William A. Adams, (c) Root zone mixes, turfgrass selection, and maintenance on the World Cup soccer fields in the U.S.A.-by Mr. Stephen T. Cockerham, (d) The construction and maintenance of soccer pitches in Europe- by Mr. Jeff Perris, (e) A new technology for sports field construction with the randomly oriented, interlocking mesh elements and its actual use case history-by Dr. James B Beard, and (f) Indoor turf/ World Cup 94 project update-by Dr. John N. Rogers III. The text is presented in both English and in Japanese.

Contact: Mr. Susumu Yoshida, Soft Science, Inc., Soft Science Publications, Nishiyama Akasaka Building 7F, 15-18, Akasaka, 2-chome, Minato-ku, Tokyo 107, Japan.
Phone: 81-3-3505-4341
Fax: 81-3-3505-4559

NAME CHANGES:

Plant taxonomists have clarified the scientific names of several turfgrasses:

- Creeping bentgrass - *Agrostis stolonifera* var. *stolonifera.*
- Colonial bentgrass - *Agrostis capillaris.*
- Hard fescue - *Festuca longifolia.*
- Redtop - *Agrostis gigantea.*

JB VISITATIONS

Oregon - September.

Made turfgrass technical assistance visitations to the main football-sports stadium at Oregon State University in Corvallis and also with representatives of the Portland Municipal Stadium. Both currently have artificial turfs and both plan to convert to natural grass fields. The extremely intense, frequent rainfall of the Pacific northwest, particularly during the fall football season, is a considerable problem and was one of the reasons they went to artificial turfs. Now with the well drained, high-sand root zones, especially when stabilized by the interlocking mesh element system, they have a viable alternative to the artificial surface, especially for intensively used fields.

JB COMMENTS

Comments on US trends in the use of natural versus artificial turfs are in order, particularly for our international readership. For both outdoor professional fields and major stadiums at universities the trend has been to convert from an artificial surface back to natural turfgrass. In the past five years there have been many stadiums where the field surface has been rebuilt. There is only one prominent field where the artificial turf has been replaced by another artificial turf and that is at Michigan State University in East Lansing.

The situation where artificial turfs have continued to be used has been in multi-use, indoor stadiums. Even in this situation there is advanced planning for an indoor domed stadium in Phoenix with a retractable roof capability where the planning is focused on a natural turfgrass field. Projections are for it to be used principally for professional baseball competitions.

UPCOMING INTERNATIONAL EVENTS

October 29-November 2, 1995. American Society of Agronomy-Crop Science Society of America-Turfgrass Annual Meetings. St. Louis, Missouri, USA.

Approximately 100 papers, both oral and poster, will be presented on recently completed turfgrass research. A highlight will be a Monday symposium and evening program featuring the 40th Anniversary Celebration of Division C-5 Turfgrass.

Contact: American Society of Agronomy, 677 South Segoe Road, Madison, Wisconsin, U.S. 53711
Phone: 608-274-1212
Fax: 608-273-2021.

February 9 to 11, 1996. 67th International Golf Course Conference and Show of the GCSAA. Orange County Convention Center, Orlando, Florida.

Contact: Golf Course Superintendents Association of America, 1421 Research Park, Lawrence, Kansas, U.S. 66049-3859
Phone: 913-841-2240
Fax: 913-832-4455

UPCOMING JB VISITATIONS

Provided for Institute Affiliates who might wish to request a visitation when I'm nearby.

- October 28 to Nov. 1 - St. Louis, Missouri.
- November 4 to 9 - Montpelier, France and London, England.
- November 18 to 25 - Kuala Lumpur, Malaysia.
- November 27 to 29 - Chicago, Illinois.
- December 5 to 8 - Columbus, Ohio.
- December 11 to 14 - New York, NY.

BENTGRASS (*AGROSTIS* spp.) GENOTYPE CHARACTERIZATIONS FOR 1994 IN TORINO, ITALY

Abstracted from

RESEARCH PROGRESS REPORT No. 302
of
Green Section, Italian Golf Federation
by
P. Croce[1], M. Mocioni[2], V. Merlo Pich[3], and J. B Beard[4]

INTRODUCTION

Creeping bentgrass (*Agrostis stolonifera* L. var. *stolonifera*) is uniquely adapted morphologically for use on putting greens (Beard, 1982). Extensive, prostrate lateral stem development via stolons and high shoot-leaf density can be sustained under frequent, close mowing of 4 to 6 mm (0.16-0.25 in.). The stolon development allows turf recovery from ball marks and other damages to the surface. Creeping bentgrass is a cool-season, C-3, perennial turfgrass that has an optimum growing temperature of 16 to 24°C (60-75°F). It responds to nitrogen (N) fertilization and to irrigation.

This is a shortened version of an Italian Golf Federation Green Section Research Progress Report on the second-year performance of bentgrass cultivars. Much more data can be found in the original report that can be obtained from Paolo Croce, Turfgrass Technical School, Via Di Monte Topino, SS Chassia Km. 44,500, 0105 Sutri (VT), Italy.

Final conclusions concerning the performance of these bentgrass cultivars under the conditions of the study in Italy can not be drawn until after a minimum of 4 and preferably 5 years of evaluations. It requires that long for the turf-soil ecosystem to stabilize in terms of the soil physical characteristics, beneficial microorganisms, disease causing fungi, insect pests, and nematode populations.

[1]Coordinator of Italian Golf Federation Green Section.
[2]Graduate Research Assistant, Plant Pathology Department at University of Torino.
[3]Golf Course Superintendent at Torino Golf Club.
[4]Director of International Sports Turf Institute and Professor Emeritus of Turfgrass Science, Texas A&M University.

MATERIALS AND METHODS

Eleven commercially available cultivars of creeping bentgrass (*Agrostis stolonifera* L. var. *stolonifera*) and one cultivar of colonial bentgrass (*Agrostis capillaris* L.) were planted to a specially constructed experimental putting green located at the Torino Golf Course north of Torino, Italy. The plot size was 2.0 by 1.75 meters (6.6 x 5.7 ft), arranged in a randomized block design with 4 replications. In addition, five advanced experimental selections of creeping bentgrass from Pennsylvania State University were located in an adjacent set of plots, involving a 1.0 by 1.0 meter (3.3 x 3.3 ft) plot size with 2 replications in a randomized block design. Root zone profile construction was a high-sand composition meeting Texas-USGA specifications, including a subsurface drainage system.

The experimental area was planted May 4, 1992. Preplant fertilization involved 1.0 kg each of N, P, and K/100 m² (2 lb/1,000 sq ft) incorporated into the upper 100 mm of the root zone. All cultivars were planted at a seeding rate of 0.5 kg/100 m² (1 lb/1,000 sq ft), with the seed lightly raked into the surface. Care was taken to avoid contamination of seed between plots. No lateral movement occurred and successful turfgrass establishment was achieved with distinct genotype perimeters between individual cultivar plots.

Subsequent cultural practices on the experimental putting green involved mowing 5 times per week in multiple directions at a 5 mm height, with clippings removed. The fertilization program consisted of 0.35 kg N/100 m² (0.7 lb/1,000 sq ft) per growing month from April through September. The base phosphorus (P) and potassium (K) levels were applied as needed to maintain these nutrient levels in the high range based on an annual chemical soil test. The pH of the root zone was 6.8. Supplemental water was applied as needed to prevent visual wilt of the turf, via a newly installed irrigation system involving gear driven, pop-up heads arranged in a tight spacing that sustained uniform moisture conditions across the experimental area. Topdressing was practiced at two-month intervals at a rate of 0.16 m³/100 m² (0.2 cu yd/1,000 sq ft). No turf cultivation or vertical cutting has been practiced on the turfed plots, to avoid interplot genotype contamination.

Disease and insect problems have been minimal, except for dollar spot (*Sclerotinia homoeocarpa*) and fairy rings (*Marasmius oreades*, *Psalliota campestris*, etc.). All emerging weeds were manually removed during the 1992 growing season. Subsequently in 1993, after the turfs had fully stabilized, all weeds were allowed to develop across the experimental area.

Turfgrass quality and morphological assessments were made on the experimental area. The turfgrass quality assessments involved visual estimates made by two people at 15-day intervals throughout the growing season. The visual estimates were based on a composite of two primary components: (a) uniformity of appearance and (b) shoot density. The rating scale used was 9 = best and 1 = poorest. A rating of 5.0 or higher represented an acceptable quality putting surface.

Morphological assessments were made in September of each growing season. They consisted of actual shoot density counts conducted on 645 mm^2 area of turf. Measurements of leaf width were based on the mid-point measurement of the second youngest leaf, with 10 leaves measured per plot. All data were summarized at the end of each growing season and processed for statistical assessment involving analysis of variance.

Any occurrences of disease or insect damage were noted, including identification of the causal organism. If the pest damage was sufficiently uniform across the plot area, assessments were made as to the percent of turf area effected. This situation did not develop in 1994, except that SR 1020 and Southshore continued to exhibit significant susceptibility to the European strain of dollar spot under a preventive fungicide program that controlled this disease on all other bentgrass genotypes.

RESULTS

Turfgrass Quality. Visual estimates of turfgrass quality, although subjective, remain the best, cost-effective means of assessing the composite turfgrass quality. The estimates reflect primarily two key components of turfgrass quality: (a) shoot/leaf density and (b) uniformity, along with the other components growth habit and smoothness. Color is best described. A rating of 5.0 or higher indicates an acceptable quality putting green.

The comparative visual assessments of turfgrass quality across the 12 commercially available bentgrass cultivars are summarized for the 1994 growing season in Table 1. Note that 1994 is the second full growing season after a May, 1992 planting. The overall seasonal means for turfgrasses quality revealed the relative rankings among genotypes were similar in both 1993 and 1994.

Ranking highest and not significantly different in mean seasonal turfgrass quality were Southshore, Penneagle, and Providence; followed by Putter and Pennlinks, and then Penncross, Cobra, and SR-1020. Ranking inferior and unacceptable as putting green surfaces with rating below 5.0 were Astoria, Seaside, Emerald and National. Three Pennsylvania State University selections, PSU G6, G1 and A1, ranked higher than any of the 12 commercially available bentgrass cultivars assessed.

Table 1. Comparative seasonal turfgrass quality ratings, shoot density, leaf blade width, and moss invasion of 17 bentgrass (*Agrostis* spp.) genotypes in 1994. Torino, Italy.

Genotype Treatment	Turfgrass Quality Seasonal Mean*	Shoot Density (per sq dm)	Leaf Blade Width (mm)	Moss Invasion Seasonal Mean (% area)
Southshore**	6.5	1126	0.84	5.3
Penneagle	6.4	1088	0.95	5.2
Providence	6.3	1093	0.85	4.1
Putter	5.9	1093	0.86	6.7
Pennlinks	5.9	1301	0.80	7.2
Penncross	5.8	987	0.85	12.3
Cobra	5.7	1007	0.88	11.2
SR 1020**	5.2	1204	0.88	8.7
National	4.9	759	0.90	18.8
Emerald	4.5	796	0.96	17.8
Seaside	3.9	765	0.90	26.8
Astoria	3.5	943	0.88	33.6
PSU G1	6.9	1903	0.73	1.9
PSU G6	6.8	1783	0.70	3.6
PSU A1	6.7	1541	0.70	1.1
PSU G2	6.5	1306	0.64	2.6
PSU DF1	5.5	1309	0.80	7.4

*Turfgrass quality ratings based on 1 to 9, with 9=best and 1=poorest.
** Significant dollar spot (*Sclerotinia homoeocarpa)* infestation even under a normal fungicide schedule followed in Italy.

Shoot Density. A high shoot density is preferred for putting greens as it causes the leaves to be narrower in width and more vertical in growth habit. A high density also results in the turf being more competitive

against weed invasion. However, certain previous cultivars of very high density have tended to form a puffy surface, if not mowed closely and frequently.

The comparative shoot densities of the 12 commercially available bentgrass cultivars after the 1994 summer season are summarized in Table 1. The shoot densities range from 1,903 to 759 shoots per square decimeter, a 2.5-fold differential. There was a decrease in shoot density between 1993 and 1994 for 15 of the 17 genotypes evaluated. However, the relative rankings among most of the cultivars remained similar from 1993 to 1994.

Ranking highest in shoot density were Pennlinks and SR-1020, followed by Southshore, Providence Putter, and Penneagle. Ranking lowest were National, Seaside, and Emerald. None of these latter three cultivars sustained an acceptable putting green turf at this close cutting height. They would be especially prone to annual bluegrass (*Poa annua*) invasion. Three PSU bentgrass selections, G1, G6 and A1, ranked substantially higher in shoot density than for any of the commercially available cultivars assessed.

Leaf Texture. A narrow leaf width or texture usually is associated with a more uniform and more fast surface for ball roll, which is due to less leaf resistance. This assumes the leaf blades among cultivars do not vary in stiffness, another component of resistance to ball roll.

The comparative leaf blade widths of 12 commercially available bentgrass cultivars are summarized in Table 1. There were significant changes in the relative rankings of cultivars for leaf widths between 1993 and 1994. Leaf textures among the 12 cultivars ranged from 0.80 mm for Pennlinks and SR 1020 to 0.90 mm for National and Seaside, and 0.95/0.96 mm for Penneagle and Emerald. The leaf width variation among most of the intermediate ranked (0.84 to 0.88) commercially available cultivars was minimal. Four of the PSU bentgrass selections, G2, G6, A1 and G1, ranked narrower in leaf blade width at 0.64 to 0.73 mm when compared to the commercially available cultivars, as well as having the highest shoot densities.

Moss Invasion. Differential rates of moss invasion continued to be observed during 1994 (Table 1). Those bentgrass cultivars with lower shoot densities exhibited the most proneness of moss invasion, which ranged from a minimal amount to as high as 50% coverage at certain times during the year. September was the month when the highest overall severity of moss invasion was visually evident.

Cultivars with the highest mean seasonal rates of moss invasion were Astoria and Seaside, with National and Emerald also exhibiting substantial moss invasion problems, followed by Penncross and Cobra. Three PSU bentgrass selections, A1, G1 and G2, ranked very low in proneness to moss invasion at less than 3% for the seasonal mean. In comparison to 1993, there was an overall increase in moss content for most bentgrass genotypes, with the relative rankings among cultivars being similar.

SUMMARY

Bentgrass (*Agrostis* spp.) cultivar characterization were initiated in May of 1992 under very closely mowed putting green conditions at the Torino Golf Club. The experimental area was a well drained, high-sand root zone. This progress report represents the assessments made during the second full growing season of a 4-year study. The findings reveal substantial variations in turfgrass quality and morphological characteristics of 17 bentgrass genotypes. Ranking high in turfgrass quality were Southshore, Penneagle, and Providence, followed by Putter and Pennlinks. Both Astoria and Seaside were totally unacceptable. Pennlinks and SR 1020 exhibited the highest shoot density. SR 1020 and Southshore continued to exhibit significant dollar spot susceptibility under a preventive fungicide program that controlled this disease on all other bentgrass genotypes. Providence, Penneagle, and Southshore had the least moss invasion. Ranking even higher than any of the commercially available bentgrass cultivars were several PSU experimental selections. These investigations will be continued for two more years before final conclusions can be drawn.

Acknowledgments:

This turfgrass research initiative was developed by the Italian Golf Federation Green Section under the F.I.G. presidency of Giuseppe Silva.

Special appreciation is given to the Torino Golf Club and its Club Manager, Renato Bianco, and its President, Alberto Brignone, for providing the host experimental site and turf maintenance of the putting green.

References:

● Beard, James B. 1982. Turfgrass Management for Golf Courses. Macmillan Company, New York, N.Y., USA. 642 pp

● Croce, P., M. Mocioni, V. Merlo Pich, and J. B Beard. 1994. Comparative dollar spot (*Sclerotinia homoeocarpa*) susceptibility of seventeen bentgrass (*Agrostis* spp.) cultivars under putting green conditions. Italian Golf Federation, Green Section-Final Research Report No. 201. 7 pp.

● Croce, P., M. Mocioni, V. Merlo Pich, and J.B Beard. 1994. Bentgrass (*Agrostis* spp.) cultivar characteristics for 1993 in Torino, Italy. Italian Golf Federation, Green Section. Research Report No. 301. 13 pp.