

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

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Green Section, Italian Golf Federation

by

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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.

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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 mm² 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.

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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.