COMPARATIVE DOLLAR SPOT (*SCLEROTINIA HOMOEOCARPA*) SUSCEPTIBILITY OF SEVENTEEN BENTGRASS (*AGROSTIS* spp.) CULTIVARS UNDER PUTTING GREEN CONDITIONS

Final Research Report No. 201
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 is widely used as the preferred grass species on putting greens in Italy. Penncross has been the cultivar most widely accepted and used throughout the world for the past 20 years. In the past 5 years, a number of commercial companies have released new creeping bentgrass cultivars. Thus, there is a need to assess their potential for use under golf course putting green conditions in Italy. Accordingly, the Italian Golf Federation (F.I.G.) initiated a bentgrass (*Agrostis* spp.) cultivar putting green evaluation study in cooperation with the Torino Golf Club north of Torino, Italy.

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 a high shoot-leaf density can be sustained under frequent, close mowing of 4 to 6 mm (0.16-0.25 inch). 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 irrigation.

[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.

Dollar spot is a disease caused by the fungal organism *Sclerotinia homoeocarpa* (F.T. Bennett). It attacks a wide range of closely mowed turfgrass species, including the *Agrostis* species and *Poa annua*, both typically found on putting greens and other golf course turfs. It is most active at temperatures of 21 to 26°C (70-80°F) and when the host grass plant is under a low nitrogen (N) nutritional level. Dollar spot is the most widespread, common disease problem of golf course turfs. It can be controlled by a number of fungicides registered for this use. Also, dollar spot can be managed through an integrated pest management (IPM) approach of using more resistant turfgrass cultivars. Failure to prevent dollar spot on *Agrostis* putting greens leads to a poor playing surface and to open spaces into which annual bluegrass (*Poa annua*) readily invade. Thus, the prevention of dollar spot also is a sound preventive approach to impair *Poa annua* encroachment into putting green turfs.

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, 5 advanced experimental selections of creeping bentgrass from Pennsylvania State University were located in an adjacent set of plots, involving a 1.0 x 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 of 1.0 kg each of N, P, and K per 100 square meters (2.0 lb./1,000 sq. ft.) incorporated into the upper 100 mm (4 inches) of the root zone. All cultivars were planted at a seeding rate of 0.5 kg per 100 square meters (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 (0.2 inch) height, with clippings removed. The fertilization program consisted of 0.35 kg of nitrogen (N) per 100 m^2 (0.7 lb./1,000 sq. ft.) per growing month from May 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 which sustained uniform moisture conditions across the experimental area. Topdressing was practiced at 2-month intervals at a rate of 0.16 m^3 per 100 m^2 (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*) which was allowed to develop as no fungicide applications were made during the 1993 season. 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.

If the pest damage was sufficiently uniform across the plot area, assessments were made as to the percent of turf area effected. This occurred in 1993 and involved principally dollar spot (*Sclerotinia homoeocarpa*). These data were of a unique quality, such that they are presented in this separate Final Research Report. All data were summarized at the end of each growing season and processed for statistical assessment involving analysis of variance.

RESULTS

Not applying any fungicides for the control of dollar spot throughout the turfgrass growing season allowed substantial differentials in disease development to occur, as shown in Tables 1 and 2. The number of dollar spots per plot shown in Table 2 indicates the number of original infection-damage sites, while the percent turf area damaged shown in Table 1 gives an indication as to the size of the damaged turf spots, relative morphological damage to the leaf blades versus stems/crowns, and the resultant relative rate of turf recovery. The number of individual dollar spots counted per plot ranged from 0 to 119 on July 30, 1993; while the percent of total turf area infected with dollar spot and associated dead turf ranged from 0 to 30%.

Table 1. Comparative incidence of dollar spot (*Sclerotinia homoeocarpa*) assessed as percent of turf area damaged for 17 bentgrass (*Agrostis* spp.) cultivars in 1993. Torino, Italy.

Cultivar Treatment	Date Evaluated											Seasonal Mean**
	5/24	6/11	6/18	6/25	7/9	7/23	7/30	8/7	8/13	10/4	11/4	
Astoria	2.8	1.7	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6 a
Seaside	2.7	2.5	0.7	1.2	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.7 a
Pennlinks	1.0	2.3	5.2	3.5	4.8	2.3	8.8	6.7	6.7	1.3	0.0	3.9 b
Penncross	2.0	4.3	8.0	8.2	6.3	1.3	5.5	5.0	5.0	2.0	1.7	4.5 bc
Cobra	2.7	4.2	5.2	4.0	6.2	4.7	9.7	5.0	6.7	3.7	8.3	5.5 cd
Providence	1.7	2.7	5.2	3.2	7.7	5.5	13.7	6.7	6.7	5.0	3.0	5.5 cd
National	3.0	4.0	9.0	10.8	7.2	5.2	13.3	11.7	10.0	2.0	0.3	7.0 cde
Penneagle	1.5	5.5	7.8	9.2	9.8	7.5	16.2	10.0	8.3	6.7	6.7	8.1 de
Putter	2.3	8.0	8.0	9.0	12.3	7.3	11.7	8.3	10.0	7.3	5.0	8.1 de
Southshore	0.8	0.3	0.8	4.8	14.2	14.2	20.8	10.0	10.0	13.3	11.7	9.2 e
SR 1020	3.5	15.0	17.5	17.3	25.0	19.5	22.0	16.7	20.0	21.7	21.7	18.2 f
Emerald	4.7	25.0	25.0	15.2	26.2	17.5	29.5	23.3	26.7	21.7	28.3	22.1 g
LSD value*	1.72	7.87	8.92	9.32	12.63	9.19	9.27	7.80	7.29	10.31	8.89	
PSU DF1	1.5	1.5	1.5	1.5	0.0	1.5	2.0	2.5	2.5	5.0	0.0	1.8 a
PSU A1	1.3	0.5	0.5	0.5	2.5	1.0	7.5	5.0	5.0	5.0	2.5	2.8 a
PSU G1	2.0	1.5	2.5	3.5	7.5	7.0	12.5	7.5	10.0	7.5	5.0	6.1 b
PSU G2	3.5	7.0	7.0	10.0	7.0	7.5	10.0	7.5	10.0	5.5	10.0	7.7 bc
PSU G6	3.0	5.0	7.0	7.0	5.0	7.0	10.0	12.5	15.0	7.5	10.0	8.1 bc

*To determine statistical differences among entries, subtract one cultivar's mean from another cultivar's mean. Statistical differences occur when this value is larger than the corresponding LSD value (LSD=0.05).

**Numbers followed by the same letter(s) are not significantly different based on the Duncan Test (p=0.05).

Table 2. Comparative incidence of dollar spot (*Sclerotinia homoeocarpa*) assessed as number of spots per 3.5 sq. m. plot for 17 bentgrass (*Agrostis* spp.) cultivars in 1993. Torino, Italy.

Cultivar Treatment	Date Evaluated					
	6/11	6/18	6/25	7/9	7/23	7/30
Astoria	6.3	1.8	0.0	0.0	0.0	0.0
Seaside	6.5	3.0	5.5	0.0	0.0	2.6
Pennlinks	6.3	10.3	11.0	18.0	8.0	24.3
Penncross	11.0	18.5	23.5	22.3	7.0	28.6
Providence	9.3	13.5	12.0	18.0	13.3	30.8
National	7.3	20.0	26.0	25.8	15.0	38.0
Penneagle	17.3	17.5	26.5	28.0	20.0	42.3
Cobra	19.3	16.5	18.8	23.8	16.5	44.5
Putter	25.5	30.0	33.5	38.8	25.0	48.6
Southshore	0.3	1.3	9.5	37.5	35.0	80.3
SR 1020	46.5	57.0	64.3	90.0	71.5	97.0
Emerald	96.3	93.0	59.3	105.3	59.8	119.3
LSD value*	31.46	31.79	35.05	44.22	30.43	37.55
PSU DF1	5.5	4.0	4.5	0.0	4.5	4.5
PSU A1	0.5	1.0	1.0	6.0	1.5	14.5
PSU G2	19.0	22.0	26.5	11.5	16.0	32.0
PSU G6	11.0	15.5	19.0	19.0	14.5	33.0
PSU G1	4.0	6.5	12.5	23.5	13.5	44.0

Among the commercially available creeping bentgrass cultivars assessed, Seaside exhibited the best season-long dollar spot resistance. Other cultivars with low susceptibility to dollar spot were Pennlinks and Penncross; followed by Cobra, Providence, and National. In contrast, Emerald and SR 1020 proved very susceptible to dollar spot. Among the Pennsylvania State University (PSU) bentgrass selections, two exhibited low susceptibility to dollar spot, DF1 and A1.

Certain genotypes exhibited a distinct seasonal pattern involving low susceptibility to dollar spot disease during the first half of the growing season up to early July, but then showed an increased incidence of dollar spot after July 1, with Southshore being a prime example and to a lesser extent PSU A1. While Southshore had a large number of dollar spots, each infected spot of dead turf was quite small compared to the much larger size of individual dollar spots for such cultivars as SR 1020 and Emerald.

SUMMARY

The dollar spot susceptibility of 17 creeping bentgrass cultivars grown under putting green conditions was evaluated near Torino, Italy. The experimental area was constructed of a well drained, high-sand root zone. The turfs were in the second full growing season at the time of the assessments. No fungicides were applied for dollar spot control during the growing season. Great variability in susceptibility of dollar spot was observed among the 17 *Agrostis* cultivars. Astoria and Seaside proved the most resistant, followed by Pennlinks and Penncross. The cultivars Emerald and SR 1020 proved especially susceptible to dollar spot, with from 20 to 30% of the turf area lost to the disease. Two advanced experimental selections from Pennsylvania State University exhibited minimal susceptibility to dollar spot, with DF1 being particularly noteworthy among the *Agrostis stolonifera* cultivars.

The most serious, continuing disease on bentgrass putting greens is dollar spot, which also is the disease most commonly treated with fungicides. Thus, bentgrass cultivars with a low susceptibility to dollar spot are desired in terms of (a) less potential turf damage, (b) less cost for fungicides, and (c) improved environmental quality strategies. Thus, it is of concern that some of the newer bentgrass cultivars possess increased susceptibility to the dollar spot disease. This dimension must be considered when selecting a bentgrass (*Agrostis* spp.) cultivar for planting on golf courses.

Acknowledgements:

This research initiative was developed by Roberto Rivetti, Chairman of the F.I.G. Green Section and Board Member under the leadership of Giuseppe Silva, President of the Italian Golf Federation.

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, J.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. Bentgrass (*Agrostis* spp.) cultivar characterizations for 1993 in Torino, Italy. Italian Golf Federation, Green Section - Research Progress Report No. 301. 13 pp.

DO THINGS EVER CHANGE?

The fairway is cut too high!
Records at a golf club in the Scottish Highlands reported a member's complaint about the poor condition of the fairways. The member suggested that "the next sheep purchased shouldhave teeth." 1700's.