1997

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HORTSCIENCE 32(5):878–879. 1997.

Season and Genotype Influence Golf Ball Roll Distance on Creeping Bentgrass

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Abstract. **Golfers are demanding increased ball roll distances on a daily basis, but cultural practices to achieve this often are detrimental to the green. One option for increasing ball roll distance without altering cultural practices may be to select creeping bentgrass genotypes that provide less resistance to ball roll. Studies were conducted at the John Seaton Anderson Turfgrass and Ornamental Research Facility near Ithaca, Neb., and at the Rocky Ford Turfgrass Research Facility in Manhattan, Kans., to determine genotype and seasonal influences on golf ball roll distance. Eighteen creeping bentgrass (*Agrostis palustris* Huds.) genotypes were evaluated. Genotype was not a significant source of variability, but the location × season interaction was. Significant seasonal differences in ball roll occurred at both locations. Ball roll distances for spring, summer, and fall were 98, 15, and 31 cm greater at the Nebraska test location than at the Kansas site. Correlations between turfgrass visual quality and ball roll distance were not significant. Therefore, the use of genotypes exhibiting high turfgrass visual quality will not necessarily result in longer ball rolls. Since there were no season × genotype or genotype × location interactions, ball roll distance on genotypes at each location changed similarly with season. Genotype selection appears to have little influence on ball roll distance under the conditions tested at these two locations.**

Green speed, a term used to describe the distance a golf ball rolls off a Stimpmeter, has become a major issue on golf courses in recent years. Golfers are demanding increased green speeds but cultural practices required to increase ball roll distances are often detrimental to the turf (Oatis, 1990; Radko, 1985). Ball roll distance can be enhanced by reducing mowing height, decreasing nitrogen nutrition rate, and increasing topdressing frequency (Salaiz et al., 1995; Shearman, 1984; Throssell, 1981). One option for increasing ball roll distance without altering cultural practices may be to select creeping bentgrass genotypes that provide less resistance to ball roll.

New creeping bentgrass (*Agrostis palustris* Huds.) genotypes that produce finer leaves, more upright growth, and denser canopies than those commonly used on present golf greens have recently been released (Engelke et al., 1995a, 1995b; Robinson et al., 1991; Skogley et al., 1993). The improved characteristics of these new genotypes may provide faster putting surfaces.

Throssell (1981) observed significant ball roll distance differences among 36 creeping bentgrass genotypes. However, the longest and shortest ball roll distance differed by only 9% (23 cm). Langlois (1985) evaluated 22 of the same bentgrass genotypes, but obtained no significant differences in ball roll distance.

The objectives of our research were to compare golf ball roll distance among new creeping bentgrass genotypes and to identify seasonal differences in ball roll distance.

Materials and Methods

We used a modified Stimpmeter (Gaussoin et al., 1995) that has the ball release notch located 38 cm from the tapered end instead of the standard 76 cm to measure ball roll distance. We tested 18 creeping bentgrass genotypes at the John Seaton Anderson Turfgrass Research Facility (JSA), located at the Agricultural Research and Development Center near Ithaca, Neb., and the Rocky Ford Turfgrass Research Center (RF) in Manhattan, Kans., during spring, summer and fall 1995. Turfgrass quality ratings (1–9, 9 = best) were taken during the summer and fall at both locations. Both sites were sand-based greens. Genotypes were arranged in a randomized complete-block design with three replications. Plots measured 1.5×1.5 m.

Data were taken at JSA on 1 June, 10 Aug., and 27 Sept. 1995 and at RF on 9 June, 8 Aug., and 10 Oct. 1995. Ball roll distance was measured 24 h after mowing, after dew was removed by dragging a hose over the plots and then waiting ≈30 min for the leaves to dry. Measurements were taken using three Titleist DT golf balls (Titleist and Foot-Joy Worldwide, Fairhaven, Mass.). The average of three rolls in one direction and the average of three rolls in the opposite direction were used to determine ball roll distance for each plot.

Management practices were as follows: JSA = mowing 6 d weekly at 3.2 mm with a walk behind greens mower containing a grooved Wiley roller; verticutting every 10 to 14 d; topdressing with sand at 0.08 $cm^3 \cdot m^{-2}$ every 10 to 14 d and N at 19.5 $g \cdot m^{-2} \cdot year^{-1}$. No herbicides, fungicides, or insecticides were applied; RF = mowing 6 d weekly at 3.9 mm with a triplex mower; sand topdressing, after fall core aeration, at 0.6 $cm^3 \cdot m^{-2}$; and N at 15.6 $g \cdot m^{-2} \cdot year^{-1}$. No fungicides were applied. The preemergence herbicide dithiopyr {3,5-pyridinedicarbothioic acid, 2-(difluoromethyl)-4-(2-methylpropyl)-6-(trifluoromethly)-*S-S*-dimethly ester} was applied on 6 Apr. 1995 with a.i. at 0.056 $g \cdot m^{-2}$ and the insecticide trichlorfon (2,2,2-trichloro-l-hydroxyethly)phosphate was applied on 9 Aug. 1995, at 0.62 $g \cdot m^{-2}$.

Results and Discussion

The genotype main effect was not significant; but the season × location interaction was highly significant (Table 1). Locations were separated and two orthogonal contrasts, the average of spring and fall vs. summer and spring vs. fall, were calculated. At JSA, both

Table 1. Analysis of variance table for ball roll distance on 18 creeping bentgrass entries at the John Seaton Anderson Turfgrass and Ornamental Research Facility near Ithaca, Neb., and the Rocky Ford Turfgrass Research Center in Manhattan, Kans.

Source	df	F	$P > F$
Location	1	1620.75	0.0001
Error a	4	12.82	0.0001
Genotype	17	1.08	0.3914
Location × genotype	17	0.68	0.8148
Error b	66		
Season	2	925.41	0.0001
Season × location	2	614.93	0.0001
Season × rep (location)	8	1.71	0.1006
Season × genotype	34	1.21	0.2214
Season × location × genotype	34	0.84	0.7174
Error c	132		

Received for publication 15 Oct. 1996. Accepted for publication 3 Feb. 1997. Joint contribution of Nebraska Agr. Res. Div. Journal No. 11693 and Kansas Agr. Expt. Sta. Contribution No. 97-75-J. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.
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Table 2. Seasonal ball roll distance averages and contrasts on 18 creeping bentgrass entries at the John Seaton Anderson Turfgrass and Ornamental Research Facility (JSA) near Ithaca, Neb., and the Rocky Ford Turfgrass Research Center (RF) in Manhattan, Kans.

	Ball roll distance (cm)		
Season	JSA		RF
Spring	305		207
Summer	213		198
Fall	241		210
Seasonal contrasts		$P > F$	
Spring + fall vs. summer	0.0001		0.0001
Spring vs. fall	0.0001		0.6691

contrasts were highly significant. At RF, the ball rolled significantly farther in spring and fall than in summer, but the distances in spring and fall were similar (Table 2).

Longer ball roll distance during the spring and fall was surprising since maximum vertical elongation occurs during these seasons in cool-season grasses (Landschoot and Waddington, 1987; Woolhouse, 1981). Dollar spot at RF was severe during the summer measurement, which may have influenced ball roll distances. When the ball hit the diseased area, some momentum appeared to be lost, resulting in shorter ball rolls.

The ball rolled farther at JSA than at RF in all seasons (Table 2). The longer ball rolls at JSA were most likely due to the lower mowing height (Langlois, 1985; Salaiz et al., 1995; Throssell, 1981) and the light, frequent topdressings (Shearman, 1984) not applied at RF.

Seasonal variation in ball roll distance at JSA was 92 cm, which is similar to data Langlois (1985) reported. High variation in some seasonal ball roll distances has been previously explained by management practices, weather, and the maturity of the turf (Langlois, 1985; Radko et al., 1981; Throssell, 1981). The seasonal variation at RF was 12 cm.

Correlations between ball roll distance and turfgrass visual quality were not significant at either location. Therefore, the use of genotypes exhibiting high visual quality ratings will not necessarily result in longer ball roll distances.

Since there were no season × genotype or genotype × location interactions, ball roll distance on genotypes at each location changed similarly across seasons. Genotype selection seems to have little influence on ball roll distance under the conditions tested at the two locations that we used.

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