Effects of Rootzone Mix Sand Bentgrass Establishment in USGA Greens

By Kevin R. Henriksen

The moisture retention capacity of the rootzone mix in USGA putting greens appears to a key property for rapid and uniform bentgrass establishment (Carlson and Kussow, 1994; Kerkman, 1994; Kerkman and Kussow, 1995). Good stand density and uniformity translate into high green quality, which is also strongly related to the moisture retention capacity of the rootzone mix (Kerkman and Kussow, 1995). From these observations, it is reasonable to say that rootzone moisture retention capacity must be relatively high to have high quality USGA putting greens.

In 1994 Kerkman observed the effect of peat particle size on bentgrass establishment and moisture retention in simulated USGA putting greens. While peat particle size was found to influence bentgrass establishment and this was related to differences in moisture retention in the top 2 to 3 inches of the rootzone mix, the actual influence on the amount of moisture retained was quite small. The moisture in the top two inches of the greens differed by less than 1.0% when the peat particle size was reduced from 6.3 to 12.5 mm to less than 0.85 mm.

The purpose of the present study was to determine the effect of sand particle size distribution on rootzone moisture levels in simulated USGA putting greens. The results, when compared with those of Kerkman (1994), should allow for response to the question of the relative importance of peat particle size versus sand particle size as far as moisture retention in the rootzone mix and the rate and uniformity of bentgrass establishment is concerned.

Table 1. Particle size analysis of sands used to prepare rootzone mixes

Size fraction	Waupaca sand	Janesville sand	50:50 blend
	%		
Fine gravel	0	0.21	0.28
Very coarse sand	0.45	9.14	4.57
Coarse sand	11.41	27.80	18.77
Medium sand	68.61	49.79	62.81
Fine sand	19.45	12.41	13.20
Very fine sand	0.05	0.50	0.29
Silt+clay	0.03	0.15	0.08

Experimental Methods

Peat for the study was prepared by grinding Canadian sphagnum peat to pass through a 20-mesh sieve. The final product contained 95.5% organic matter and the particles were all between 0.5 and 0.05 mm in diameter. The peat was blended with two commercially available sands and a 50:50 mix of the two sands at a sand:peat ratio of 80:20 (v/v). Sieve analysis of the sands are shown in Table 1. Note that the Waupaca sand is finer than the Janesville sand and contains 19.4% fine sand, which is very near the 20% maximum allowed by USGA standards. As expected, the particle size distribution of the 50:50 blend of the two sands was intermediate between those of the Waupaca and Janesville sands. All three sands satisfy USGA specifications for rootzone mixes.

The rootzone mixes were packed into 6-inch diameter PVC cylinders to a depth of 12 inches. The rootzone mixes were underlain by 3 inches of pea gravel held in the PVC cylinders by hardware cloth. Starter fertilizer was incorporated into the top 1/2-inch of the rootzone mixes and the cylinders seeded with 2 lb/M of SR 1020 pure live seed. After wetting the simulated putting greens until drainage occurred, they were loosely covered with plastic sheeting until the bentgrass began to emerge. The greens were then watered lightly 3 to 4 times a day until emergence appeared to be complete. The watering frequency was then reduced to once per day. Clipping of the greens at 1/2-inch began as soon as this height was achieved. The greens received 0.2 lb N/M as urea after the first clipping.

Observations made included visual rating of the greens for emergence rate, seedling vigor and color, growth rate and stand density. Clippings were collected over an 18-day period and the total weight recorded. At this time a Time Domain Reflectometer was used to measure rootzone moisture content 24 hours after irrigating to the point where drainage from the cylinders occurred.

Table 2. Bentgrass quality ratings and clipping production during establishment.

Sand in the rootzone mix	Quality ratings					Clipping weight
	Emergence	Color	Vigor	Growth	Density	
	Scale 1 to 5, 5 = best mg					
Waupaca	5.0	4.5	4.8	5.0	5.0	893
Janesville	2.5	3.9	2.2	2.8	2.2	414
50:50 Blend	3.5	4.0	4.0	4.0	3.8	693

Observations

For a given rootzone mix, there was strong correspondence among the visual ratings of the green and with clipping weight (Table 2). In other words, if a particular mix had the highest emergence rating, it also ranked highest in all other quality ratings and in clipping production.

Use of the Waupaca sand in the rootzone mix led to the fastest bentgrass emergence and highest stand density and uniformity (Table 2). Lowest in this regard was the Janesville sand green. The blend of the two sands provided intermediate ratings and bentgrass clipping weights.

Moisture contents of the putting greens differed primarily in the top 1 to 2 inches of the rootzone mixes (Figure 1). At this depth the Waupaca sand mix retained 12.6% water while the Janesville mix contained only 7.72% water. The blend of the two sands retained 11.2% moisture at this depth. While these differences in moisture retention capacitites may appear to be small, they did largely account for differences among the rootzone mixes in average bentgrass quality ratings (Figure 2) and clipping weights (Figure 3).

Fig. 1. Moisture retention by rootzone mixes differing in the sand used.

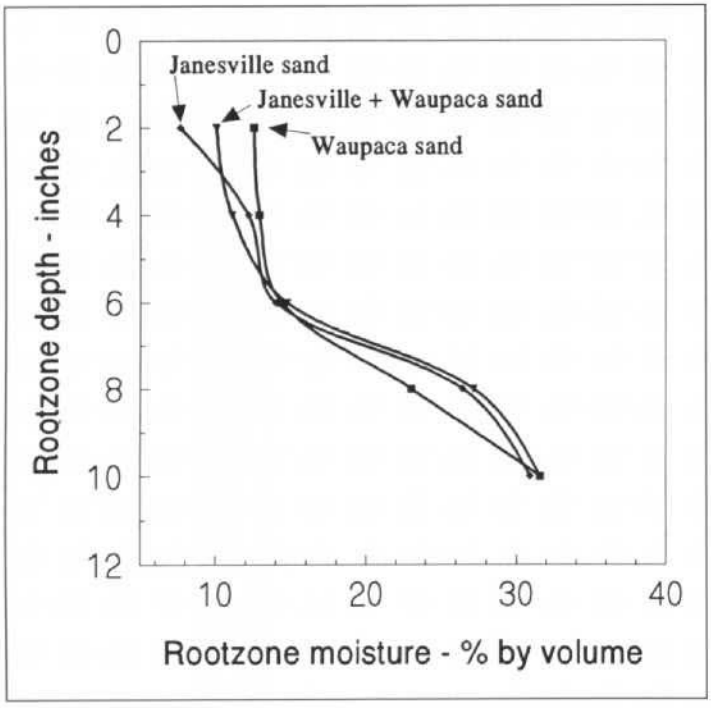


Fig. 3. Relationship between rootzone moisture at a 2-inch depth and total clipping production by bentgrass 18 days following the beginning of emergence.

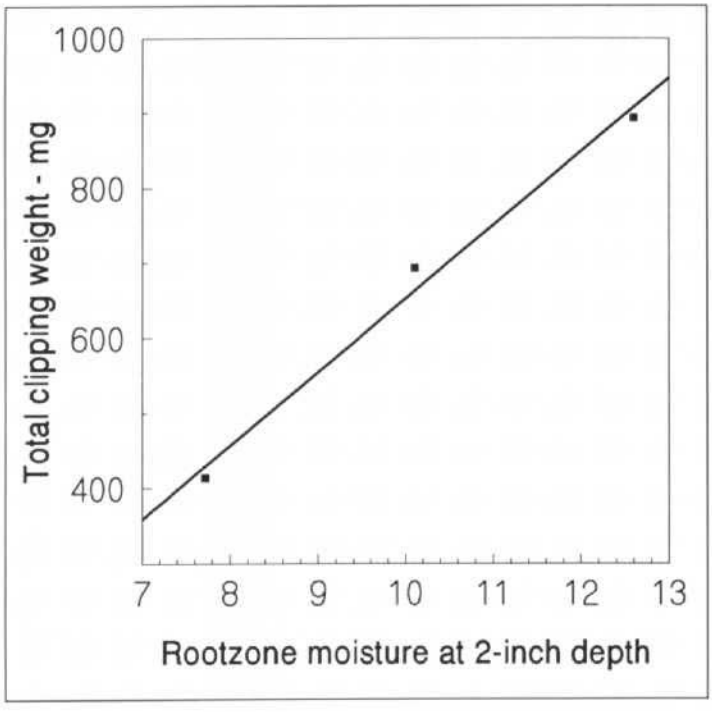
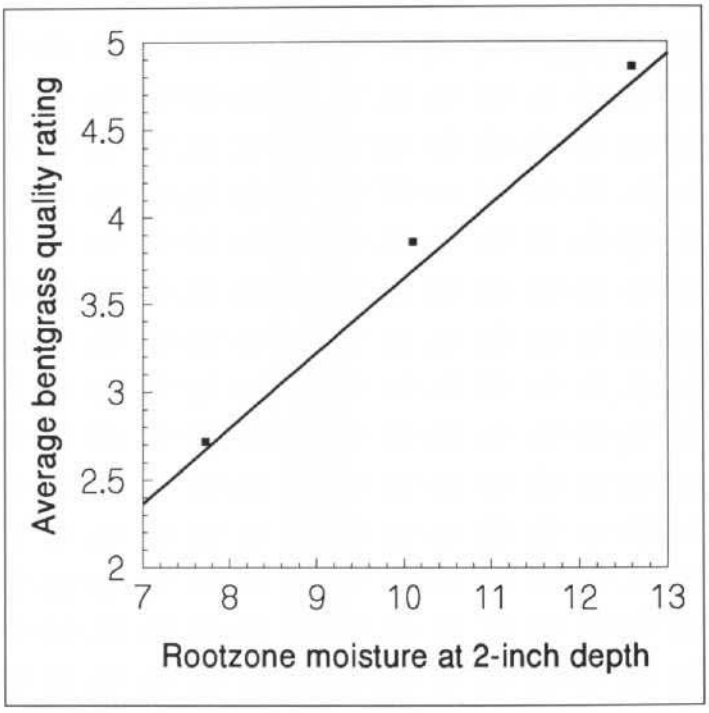


Fig. 2. Relationship between rootzone moisture at a 2-inch depth and the average of ratings for 5 different putting green quality parameters during bentgrass establishment.



Conclusions

The results of this study and those cited earlier collectively illustrate the importance of the rootzone mix moisture retention capacity during bentgrass establishment on USGA putting greens. Comparison of the results of this study with those of Kerkman (1994) lead to the conclusion that moisture retention is much more dependent on the particle size distribution of the sand used in the rootzone mix than on peat particle size.

Editor's note: Kevin Henriksen is a December 1994 graduate of the University of Wisconsin-Madison Turf and Grounds Management Program. This study was conducted as a Special Problem under the guidance of Dr. Wayne R. Kussow.

References Cited

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