WGCSA Research Project: Managing the New Bentgrasses and Perennial Annual Bluegrasses for Putting Greens

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What's the Big Deal?

Every once in a while a new turfgrass type comes along that galvanizes and excites the industry. In the mid 1990s a suite of grasses known as the A and G series was released by Dr. Joe Duich at Pennsylvania State University. The grasses were developed from clones selected from putting greens in Augusta, Georgia, giving rise to the designation "A" and "G". The six new varieties released were 'A-1', 'A-2', 'A-4', 'G-1', 'G-2', and 'G-6'. All were characterized by their narrow leaf texture and upright growth, with tremendous density that helped resist *Poa annua* invasion (Beard et al., 2001; Fraser, 1998). Evidence also suggested they had better disease resistance and summer stress tolerance than other bentgrasses (Fraser, 1998; Landry and Schlossberg, 2001.

Due to their extreme density, and apparently rapid growth rate, Dr. Joe Duich recommended lower than normal cutting heights (typically 0.1 to 0.125 inch) and more frequent topdressing to combat thatch development. Fraser (1998) surveyed some of the earliest superintendents who were managing A and G series greens and found a variety of management programs were used. Topdressing frequencies ranged from once every two to four weeks and core aeration varied from two to six times annually. In Wisconsin, superintendents discussed their concerns with me regarding what was seen as unknown or unrealistic management requirements for the A and G bentgrasses. A very specific concern was that the high turf density would prevent all but the smallest topdressing particles from entering the turf, resulting in a fine textured sand over a coarser root zone that would reduce drainage rates.

After years of development a perennial, stoloniferous type of annual bluegrass (*Poa annua var. reptans*) was released for use on putting greens by Peterson Seed Co in 1997. The grass had been a long-term project in Dr. Don White's breeding program at Minnesota, with financial support provided by the USGA. The feeling was that since *Poa annua* existed throughout the country and usually became a primary grass on most putting greens over time, why not develop a variety specifically for putting greens? I had seen Dr. White's putting green plots at the university and was quite impressed with the uniformity, density, and complete lack of seedheads. As with the A and G series bentgrasses, though, a lack of research on the management requirements could choke its acceptance by the industry. Originally named DW-184, it is now sold under the name of 'Tru-Putt'.

In 1998 the WGCSA agreed to fund a three-year project to investigate the management requirements of A-4, G-2, and DW-184. The objectives were to evaluate thatch development and topdressing losses compared to 'Penncross', as influenced by different aeration and topdressing programs. Data collection was completed the end of 2001, data were analyzed and a scientific manuscript were submitted in 2002, with publication during autumn 2003.

How was the project conducted?

Establishment and maintenance. Plots were seeded on a USGA-specified sand-based root zone at the O.J. Noer Turfgrass Research and Educational Facility in September 1998. Following grow-in, turf was fertilized four times annually for a total of 3.5 lb N per thousand square feet using a 21-3-12 fertilizer with 80% water-insoluble nitrogen. Plots were mowed six days weekly using a walking greensmower with clippings removed. Turf was irrigated daily to replace 100% of the moisture lost based on evapotranspiration rates. Curative applications of fungicide were applied during the summer to allow some estimate of susceptibility to dollar spot disease.

Treatments. Treatments consisted of A-4, G-2, Penncross, and DW-184 each planted in three repetitions (replicates) measuring 180 square feet. The plots were split, one-half receiving core aeration once each October using 0.5 inch tines with the other half aerated four times annually using quadratines for all but the October aeration. Plots were further split to receive topdressing at monthly intervals, biweekly with verticutting, or biweekly without verticutting. An 80:20 sand:peat mixture was used for topdressing, and aeration was timed so that all plots were topdressed within 24 hours. The topdressing was brushed and watered in after application. The monthly topdressing rate was 0.1 cubic yards per thousand square feet, equal to a depth of 0.03 inches, or about one-quarter the cutting height. Topdressing at the two-week intervals was applied at

half the rate (see Beard, 2002, for additional information on rates).

Data collection. Sand topdressing removed by mowing the day after application was collected from each plot, separated from clippings, oven-dried, sieved according to USGA specifications, then each fraction was weighed to determine the percentage of topdressing removed based on known weights of topdressing applied. Thatch depth was measured each autumn of 2000 and 2001. Turf was rated visually each growing month from 1999 through 2001 for color, quality, and disease. Additional details are provided in Stier and Hollman (2003).

The Big Picture

As expected both A-4 and G-2 had much better turf quality than Penncross (Fig. 1). A-4 tended to have a darker green color while G-2 had more of a candy-apple green color which was quite beautiful. Both had a more uniform appearance, and much better density, than Penncross. The DW-184 was disappointing: abundant seedheads throughout 1999 indicated the seed lot was likely infested by seed of annual *Poa annua*. Quality did improve over time as the perennial types seemed to displace much of the annual types, but turf quality of DW-184 was never excellent or even acceptable. Surprisingly, A-4 had five times or more dollar spot development than Penncross, while DW-184 had even more. G-2 and Penncross had the least amount of dollar spot (data not shown).

Both A-4 and G-2 produced more organic matter in the upper soil profile than Penncross or DW-184 (Fig. 2). All topdressing regimes, though, appeared to be sufficient to effectively dilute the thatch and prevent the greens from becoming "puffy", so the organic matter we measured was more appropriately termed "mat"

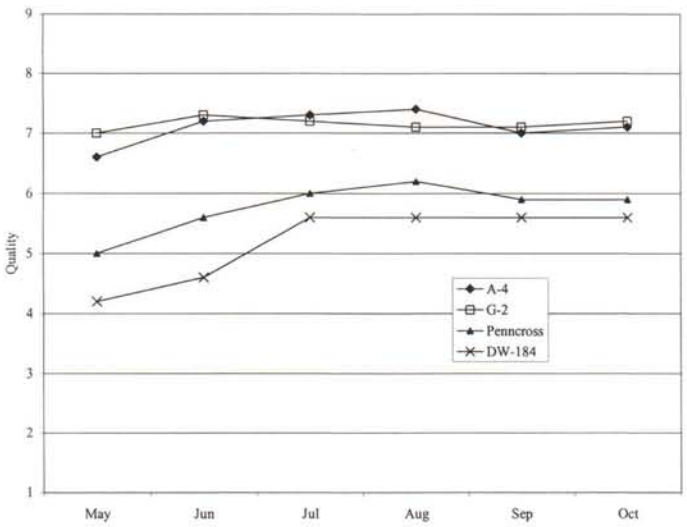

Fig. 1. Turf quality of three creeping bentgrass cultivars and DW-184, a *Poa annua* var. *reptans*, in Wisconsin averaged over 2000 and 2001. A-4 and G-2 had significantly greater quality ratings on a one to nine scale than Penncross or DW-184 at a P value of < 0.05.

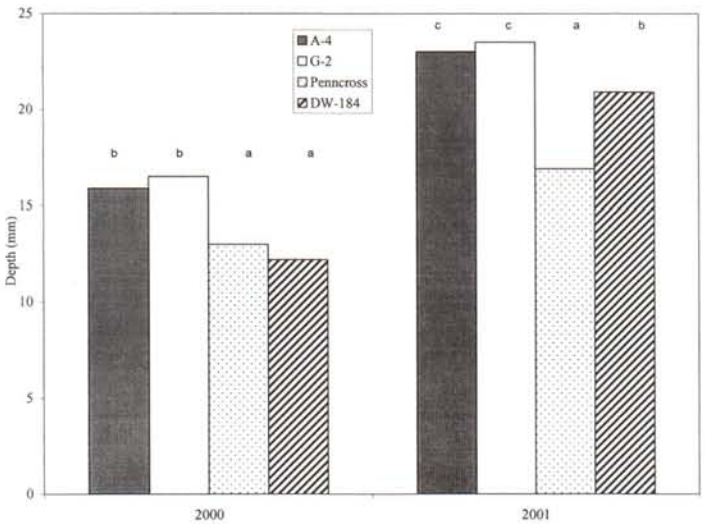

Fig. 2. Thatch/mat layer of three creeping bentgrass cultivars and DW-184, a *Poa annua* var. *reptans*, as a putting green turf in Madison, WI.

rather than thatch. Ideally we would have continued to collect data on thatch production and green speed over a 5 to 10 year period, but the cost of maintaining the plots and collecting the data were prohibitive compared to the additional information that might have been gleaned. It's safe enough to say that superintendents do have cause to be watchful for thatch buildup with the A and G bentgrasses, though it shouldn't become a problem if topdressing applications are sufficient to dilute the thatch. Our rates were on the moderate side: in normal practice, rates and frequency should be based on mowing height and growth rate which will vary according to local conditions. In general, a greater frequency of topdressing is more important than infrequent, heavy topdressings which might produce a layered effect, ultimately inhibiting drainage and rooting.

The type of grass had minor

effects on the size fraction of topdressing removed by mowing. Data indicated approximately 21% of the very coarse sand in the topdressing mix was removed from Penncross, compared to 24.5 and 24.0% removed from A-4 and G-2, respectively (Table 1). On the other hand, slightly more medium-sized topdressing was removed from Penncross compared to A-4 and G-2.

Statistically, the topdressing method showed differences in the total amounts of topdressing removed depended on the turf type (Fig. 3). In general, monthly topdressing resulted in more topdressing removed by mowing than biweekly topdressing, while biweekly topdressing and verticutting resulted in the least amount of topdressing removed. Although these differences were statistically significant, they likely have little practical significance because mowing only removed approximately 1 to 2% of the topdressing applied.

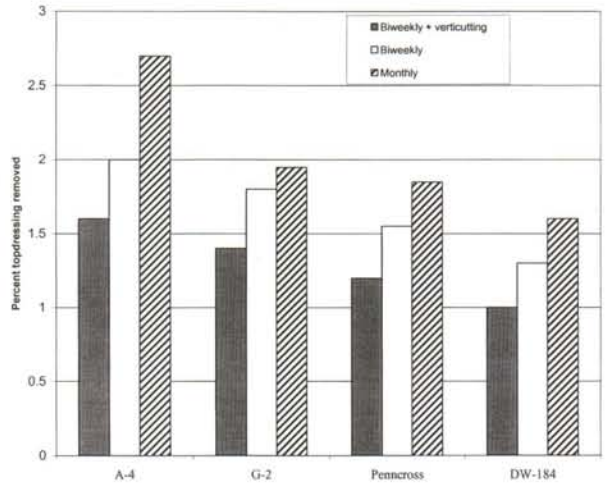

Fig. 3. Effect of topdressing frequency and verticutting on topdressing removal from three creeping bentgrass varieties and DW-184 (*Poa annua* var. *reptans*), averaged over 2000 and 2001 in a putting green situation at the O.J. Noer Turfgrass Research and Educational Facility, Madison, WI.

Table 1. Proportion of topdressing sizes removed by mowing from three bentgrass cultivars and *Poa annua reptans* 'DW-184', O.J. Noer Turfgrass Research and Educational Facility, Verona, WI, 28 July 2001.

	Particle size					
	mm					
	>2	2-1	1-0.5	0.5-0.25	0.25-0.15	<0.15
	% Fraction in Original USGA-spec Topdressing					
	0.94	3.30	17.99	65.62	12.15	---
	% of total sand topdressing removed by mowing					
A-4	7.2	24.5 bc†	33.6 b	32.0 a	2.7	---
G-2	7.7	24.0 b	33.3 b	32.4 a	2.6	---
Penncross	9.8	21.1 a	31.7 ab	35.4 bc	2.9	---
DW-184	10.3	22.6 ab	29.9 a	34.2 ab	2.8	---

† Numbers followed by the same letter, or no letters at all, are not significantly different from one another.

The Bottom Line

Both A-4 and G-2 provided far superior turf quality to Penncross. Results over 3 years indicated topdressing and aeration practices don't need to be significantly different than normal management practices, assuming topdressing is applied at least monthly (2 to 3 week intervals may be better). From a practical standpoint, verticutting is not needed to ensure topdressing enters the turf canopy as usually less than 2% of the topdressing is removed anyway. There were no important differences in the size of topdressing removed by mowing based on grass type.

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References

Beard, J.B. 2002. Turf management for golf courses, 2nd ed. Ann Arbor Press, Chelsea, MI.

Beard, J.B., P. Croce, M. Mocioni, A. DeLuca, and M. Volterrani. 2001. The comparative competitive ability of thirteen *Agrostis stolonifera* cultivars to *Poa annua*. Int. Turfgrass Soc. Res. J. 9:828-831.

Fraser, M. 1998. Managing the new cultivars of creeping bentgrass. Golf Course Mgt. 66(8):53-56

Landry, G., and M. Schlossberg. 2001. Bentgrass (*Agrostis* spp.) cultivar performance on a golf course putting green. Int. Turfgrass Soc. Res. J. 9:886-897.

Stier, J.C., and A.B. Hollman. 2003. Cultivation and topdressing requirements for thatch management in A,G bentgrasses (*Agrostis stolonifera* L.) and creeping bluegrass (*Poa annua* var. *reptans* Hausskn). HortScience 38:1227-1231.