Aeration Timing and the Use of Black Sand to Enhance Putting Green Recovery

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INTRODUCTION

Newer cultivars of creeping bentgrass (*Agrostis stolonifera* L.) create an exceptional golf green surface but their dense aggressive growth habit, if unmanaged, result in an accumulation of a thatch-mat layer (Sifers et al., 2001). Core aeration, a common method used to manage thatch-mat, causes disruption and decreases the surface quality (McCarty et al., 2007). Dark colored topdressing material has been used in the spring and fall to enhance spring green-up or to delay fall dormancy by increasing soil temperatures (Anonymous 1980; Foy, 1990; Taylor, 2001). More recently, black sand topdressing has been used in the fall and spring and has shown increased soil temperature, tillering, and clipping yield (Bigelow et al., 2005; Hamilton, 2003; Hamilton and Raley, 2004; Street et al., 2007).

In the Intermountain Pacific Northwest, cool-season turfgrass growth occurs from April through September. With such a short growing season, timing of disruptive aeration practices, which reduces golf green playability, can be difficult. Multiple aeration dates beginning 15 April and continuing through 15 September and two topdressing sand types were used to determine the time of year that results in the fewest days to recover on an established 'T-1' creeping bentgrass golf green.

Objectives

1. Determine the time of year that results in the fastest recovery time from core aeration.
2. Establish if black sand topdressing has an effect on recovery time.

MATERIALS AND METHODS

Experimental area

Research was conducted from April 2008 to September 2009 at the Washington State University Turfgrass and Agronomy Research Center, at Pullman, WA, on a creeping bentgrass research putting green The aeration date and sand topdressing treatments were a 2 12 factorial of topdressing sand and aeration date (Fig. 1-6). Individual plots size was 1.22 1.22 m and were arranged in a randomized complete-block split-plot design with four replications. In 2009, two aeration dates, 15 July, and 1 August, were added to the 2008 treatment dates.

Aeration dates
- 15 Apr.
- 1 May
- 15 May
- 1 June
- 15 June
- 1 July
- 15 July (2009 only)
- 1Aug. (2009 only)
- 15 Aug.
- 1 Sept.
- 15 Sept .

Sand Type
- Tan sand (TS)
- Black sand (BS)

Measurements

Visual injury, turfgrass quality, soil temperature, and turfgrass color (2009 only) were evaluated. Data was collected until all plots within an aeration date were fully recovered from injury.

Visual Injury
- Rated 1 to 9; 9 is no detectable disruption from cultivation and 1 is maximum injury from cultivation treatment.
- Visual injury data was used to determine the days required for aeration treatments to recover.

Turfgrass Quality
- Rated (based on color, shoot density, and uniformity of stand) 1 to 9; 9 is ideal, dark green uniform turf, 6 is minimum acceptable quality, and 1 is dead turf.
- Ratings were recorded twice weekly.

Soil Temperature
- 2008, soil temperature recorded semi-weekly at 7.5 cm depth with a digital thermometer.
- 2009, temperatures were recorded semi-weekly at a 2.5 cm depth.

Turfgrass Color
- 2009, visual turfgrass color rated semi-weekly 1 to 9; 9 is ideal, dark turf, 6 is minimum acceptable color, and 1 is brown, dead turf.

Fig. 1. Core aeration 1.27-cm-diam. tines

Fig. 2. Drop spreader sand application

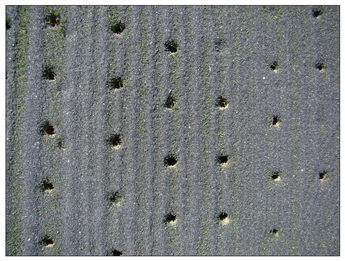

Fig. 3. Black sand 20,000 kg ha^{-1}

Fig. 4. Tan sand 20,000 kg ha^{-1}

Fig. 5. Topdressing sand brushed in

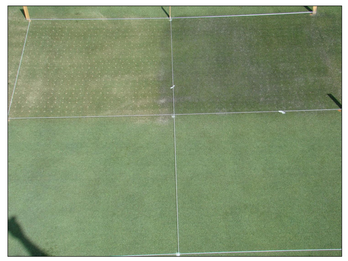

Fig. 6. Recently aerated tan sand (left) and black sand (right) treated plots

Fig. 7. Days to recover for core aeration treatments using tan and black sand as topdressing, 2008.

Fig 8. Days to recover for core aeration treatments using tan and black sand as topdressing, 2009.

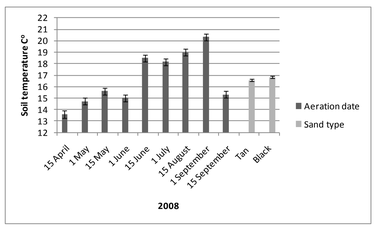

Fig 9. Soil temperature at 7.5 cm depth for core aeration treatments using tan and black sand as topdressing, 2008.

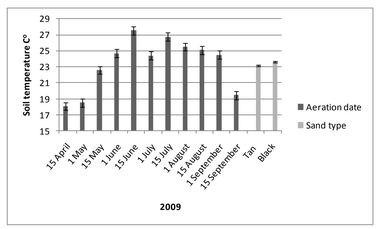

Fig. 10. Soil temperature at 2.5 cm depth for core aeration treatments using tan and black sand as topdressing, 2009.

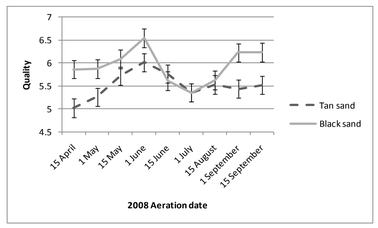

Fig. 11. Turfgrass quality for core aeration treatments using tan and black sand as topdressing, 2008.

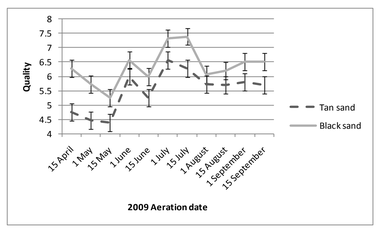

Fig. 12. Turfgrass quality for core aeration treatments using tan and black sand as topdressing,2009.

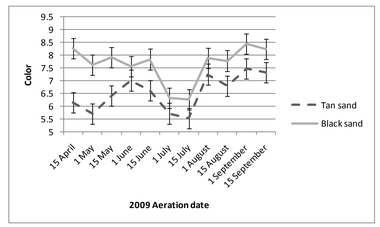

Fig. 13. Turfgrass color for core aeration treatments using tan and black sand as topdressing, 2009.

RESULTS

Days to Recover
- Most days to recover (DTR) was early spring (Fig. 7 and 8).
- Decrease in DTR at 15 May aeration date.
- Sand type different at June and Sept. aeration dates when BS < TS.
- 15 Aug. had fewest DTR.

Soil Temperature
- Soil temperature increase from 1 May to 15 May aeration date, which corresponds with DTR at the same dates (Fig. 9 and 10).
- Highest soil temperatures were in the summer.

Turfgrass Quality
- Greatest differences in quality between sand type was in spring and fall (Fig. 11 and 12).
- In general, BS had higher quality ratings than TS.
- BS had as much as a 25% increase in quality over TS.

Turfgrass Color
- Sand type had the greatest influence turfgrass color at 15 Apr. aeration date (Fig. 13).
- BS had higher turfgrass color ratings at each aeration date compared to TS.

CONCLUSIONS

- Aeration timing effected DTR
- To minimize DTR, the best time of year to core aerate in Pullman, WA was mid-May and mid-August to mid-September.
- Late fall aeration with BS topdressing reduced the number of DTR compared to using TS.
- BS topdressing showed an increase in turfgrass quality and color, especially in the spring and fall.
- It has been suggested that BS application in the summer would result in turfgrass burning due to excess temperature (Hamilton and Raley, 2004). In the current study, BS did not result in decreased turfgrass quality due to burning, although when daytime temperatures rose above 32^{o}C localized dry spots did appear in both BS and TS treatments.
- Further research could be done to elucidate the color response due to BS. It is still unclear what causes the deepening turfgrass color.

References

Anonymous. 1980. What has happened to charcoal? Sports Turf Bull. 129:8-9.

Bigelow, C.A., G.W. Hamilton, G.A. Hardebeck, and J.R. Nemitz. 2005. Creeping bentgrass spring green-up as affected by late season application of two sand topdressing products. Int. Turf. Res. Conf. Annexe Tech. Papers 10:58-59.

Foy, J.H. 1990. Topdressing of a different color. USGA Green Sect. Record 28(2):2-3.

Hamilton, G. 2003. Evaluation of colored sands as a material to enhance putting green turf spring green-up. p. 4-6. *In* 2003 Turf Res. Rep. Pennsylvania State Univ., State College, PA.

Hamilton, G.J., and R. Raley. 2004. Black sand and turf cover effects on new putting green spring green-up and tillering. p. 94-96. *In* 2004 Turf Res. Rep. Pennsylvania State Univ., State College, PA.

McCarty, L.B., M.F. Gregg, and J.E. Toler. 2007. Thatch and mat management in an established creeping bentgrass golf green. Agron. J. 99(6):1530-1537.

Sifers, S.I., J.B. Beard, and M.L. Fraser. 2001. Botanical comparisons of twelve *Agrostis* cultivars in a warm-humid climate. Int. Turf. Soc. Res. J. 9:213-217.

Street, J., D. Holdren, D. Gardner, and P. Sherratt. 2007. Bermudagrass fall color retention and spring green-up as affected by topdressing and covers. p. 29-31. *In* 2007 Turf & Landscape Res. Field Day: Proc. Ohio State Univ., Columbus, OH.

Taylor, D. 2001. Late-fall topdressing and a faster spring recovery. Golf Course Manage. 69(10):54-57.

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