Influence of Height of Cut and Mowing Frequency on Ball Roll Distance and Turfgrass Quality

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INTRODUCTION

When preparing for a golf tournament, golf course superintendents' primary goal is to provide consistently fast and smooth greens while maintaining healthy turf.

Research involving green speed has focused mostly on quantifying individual cultural practices on ball roll distance. Additionally, the goal of most research has been to identify cultural practices that maintain a reasonable ball roll distance while lowering the stress caused to turfgrass through standard cultural practices, such as mowing frequently at a low height of cut.

However, when turfgrass managers are preparing greens for a tournament, they are faced with integrating a variety of cultural practices into a program to develop the best possible playing surface for a short period of time.

The objectives of this study are:

1. To determine the effect of mowing frequency and height of cut on ball roll distance on golf course putting greens.
2. To determine the impact of mowing frequency and height of cut on turfgrass quality.
3. To lay the groundwork for future experiments examining the effects of multiple cultural practices integrated into a program.

MATERIALS AND METHODS

Three experiments were initiated in 2015 at the Valentine Turfgrass Research Facility and conducted on separate putting greens consisting of the following species:

- Annual bluegrass *(Poa annua L.) (AB)*
- 'Penn A-4' creeping bentgrass (*Agrostis stolonifera L.*), (CBG)
- 'Bridgeport II' fine fescue (*Festuca rubra subsp. cummutata* L.; 90%) and Alister colonial bentgrass (*Agrostris capillaris* L.; 10%) (FF)

Each experiment was designed as a 3x3 factorial and arranged as a randomized compete block with 3 replications. The plot size in each experiment was 1.5 meter by 3 meter.

MAIN EFFECTS

HEIGHT OF CUT (HOC)

AB/CBG	FF
2.1 mm	4.0 mm
2.5 mm	4.5 mm
2.9 mm	5.0 mm

MOWING FREQUENCY (MF)

One pass: single cut (SC)
Two passes: double cut (DC)
Four passes: double-double cut (DD)

Single cut plots were mowed up and back in an adjacent line, while DC plots were mowed up and back in the same line. DD plots received a DC in the morning and afternoon. Ball roll distance (BRD) was measured three times per day using a U.S.G.A. Stimpmeter. Plant health (PH) was measured using visual quality assessments.

RESULTS

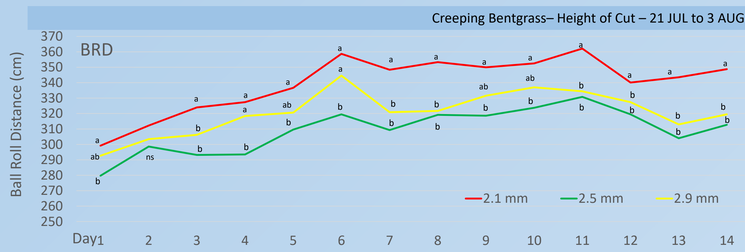

Figure 1. Ball roll distance (BRD) after morning mowing operations as affected by height of cut on a creeping bentgrass putting green. All data were subjected to analysis of variance using PROC MIXED and means were separated at $P \leq 0.05$ according to Fisher's Protected least significant difference test.

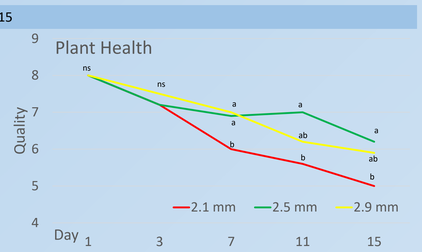

Figure 2. Turfgrass quality on a creeping bentgrass putting green. All data were subjected to analysis of variance using PROC MIXED and means were separated at $P \leq 0.05$ according to Fisher's Protected least significant difference test.

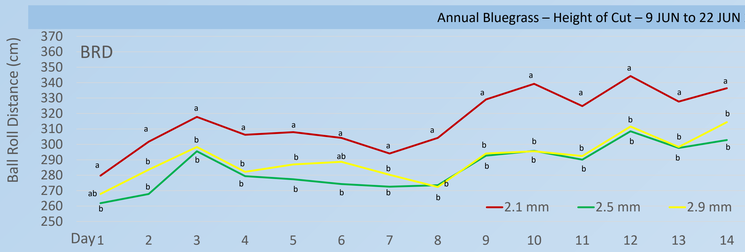

Figure 3. Ball roll distance (BRD) after morning mowing operations as affected by height of cut on an annual bluegrass putting green. All data were subjected to analysis of variance using PROC MIXED and means were separated at $P \leq 0.05$ according to Fisher's Protected least significant difference test.

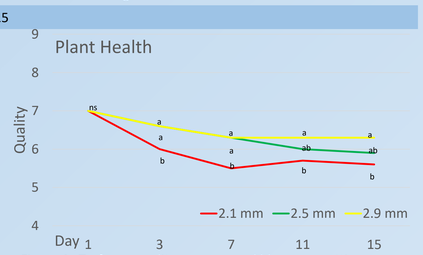

Figure 4. Turfgrass quality on an annual bluegrass putting green. All data were subjected to analysis of variance using PROC MIXED and means were separated at $P \leq 0.05$ according to Fisher's Protected least significant difference test.

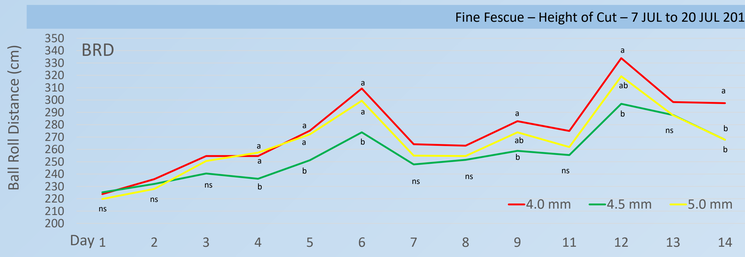

Figure 5. Ball roll distance (BRD) after morning mowing operations as affected by height of cut on a fine fescue putting green. All data were subjected to analysis of variance using PROC MIXED and means were separated at $P \leq 0.05$ according to Fisher's Protected least significant difference test.

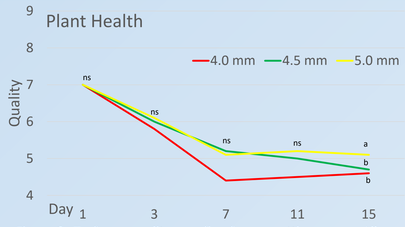

Figure 6. Turfgrass quality on a fine fescue putting green. All data were subjected to analysis of variance using PROC MIXED and means were separated at $P \leq 0.05$ according to Fisher's Protected least significant difference test.

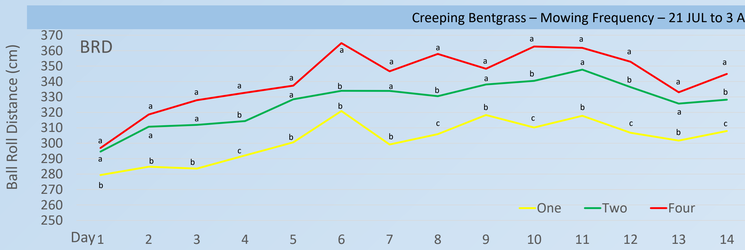

Figure 7. Ball roll distance (BRD) after morning mowing operations as affected by mowing frequency on a creeping bentgrass putting green. All data were subjected to analysis of variance using PROC MIXED and means were separated at $P \leq 0.05$ according to Fisher's Protected least significant difference test.

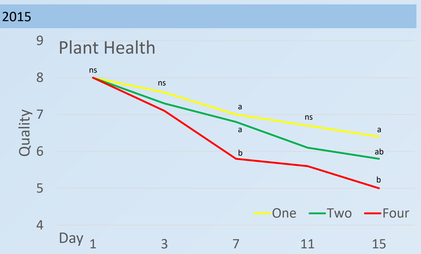

Figure 8. Turfgrass quality on a creeping bentgrass putting green. All data were subjected to analysis of variance using PROC MIXED and means were separated at $P \leq 0.05$ according to Fisher's Protected least significant difference test.

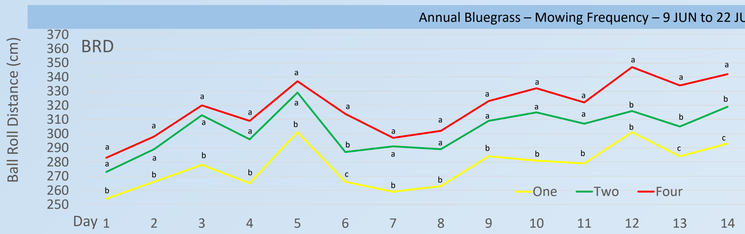

Figure 9. Ball roll distance (BRD) after morning mowing operations as affected by mowing frequency on an annual bluegrass putting green. All data were subjected to analysis of variance using PROC MIXED and means were separated at $P \leq 0.05$ according to Fisher's Protected least significant difference test.

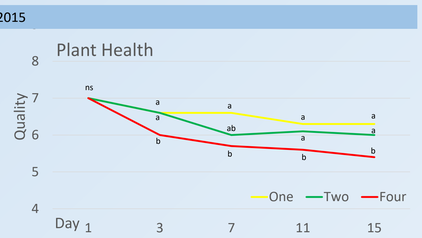

Figure 10. Turfgrass quality on an annual bluegrass putting green. All data were subjected to analysis of variance using PROC MIXED and means were separated at $P \leq 0.05$ according to Fisher's Protected least significant difference test.

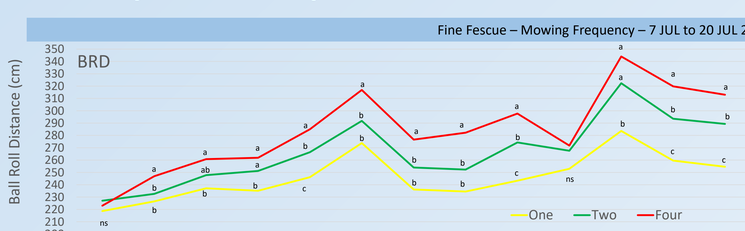

Figure 11. Ball roll distance (BRD) after morning mowing operations as affected by mowing frequency on a fine fescue putting green. All data were subjected to analysis of variance using PROC MIXED and means were separated at $P \leq 0.05$ according to Fisher's Protected least significant difference test.

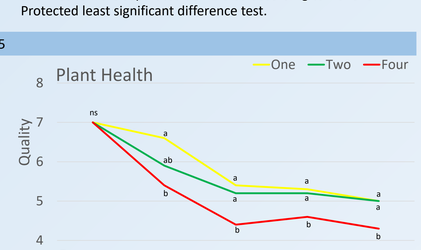

Figure 12. Turfgrass quality on a fine fescue putting green. All data were subjected to analysis of variance using PROC MIXED and means were separated at $P \leq 0.05$ according to Fisher's Protected least significant difference test.

RESULTS

Height of Cut

- CBG/AB: 2.1 mm HOC consistently had the greatest BRD and few differences in BRD existed between 2.5 mm and 2.9 mm
- BRD increased up to 40 cm on CBG and 50 cm on AB when comparing 2.9 mm to 2.1 mm HOC
- FF: HOC only impacted BRD on 6 of 14 rating dates
- CBG: BRD stabilized after 6 days for each HOC
- AB: BRD stabilized after 9 days for each HOC
- Lowest HOC produced the lowest turfgrass quality for all turfgrass species

Mowing Frequency

- Increased MF increased BRD for all turfgrass species
- BRD increased up to 47, 46, and 46 cm on CBG, AB and FF when comparing SC to DD, respectively
- Plots receiving the DD mowing frequency reduced turfgrass quality across all turfgrass species when compared to SC and DC
- No differences in turfgrass quality in plots receiving SC or DC mowing frequencies

CONCLUSION

Decreased HOC increased BRD, however, the impact on plant health was significant. Increased MF had a similar effect on BRD while mowing turf four times per day resulted in a greater reduction in turf quality than SC and DC mowing frequencies. Effects on BRD due to changes in HOC and MF stabilize between 6 and 9 days. Interestingly, when BRD was evaluated at each HOC, MF of SC and DC had few differences, suggesting that the mowing pattern may be an important factor in BRD.

CONTINUING WORK

- Height of cut x mowing frequency experiments repeated in 2016
- Initiated mowing pattern x nitrogen x plant growth regulator experiment in 2016, repeat in 2017.
- Initiated brushing x mowing frequency experiment in 2016, repeat in 2017.

REFERENCES

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