Using New Technologies to Assess Performance of Championship Putting Greens

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Introduction

Golf course putting greens are some of the most highly managed turfgrass stands. Expectations for how putting surfaces perform are set by players, spectators, and turf managers. A putting green surface performance is often measured with the resistance to a ball rolling across the surface (green speed). The greater the distance of a golf ball roll the faster the green speed. For almost 50 years the Stimpmeter has been used to quantify a ball roll distance or green speed, however, recently the United States Golf Association has developed a new technology that will measure ball roll distance with sensors in the golf ball. This technology, called the GS3, offers the ability to not only test ball roll distance, but also deviations of the ball rolling from a horizontal and vertical line (which tell how straight the golf ball rolled as well). Finally, the GS3 can be used to test how firm a putting surface is, with previous research suggesting a firmer surface would offer a greater ball roll distance. While this new technology exists, little is known about how various management techniques like the use of plant growth regulators or mowing frequency would affect readings compared to traditional devices.

Materials and Methods

A trial was initiated in the fall of 2024 and repeated in 2025 at the Iowa State University Horticulture Research Station on a creeping bentgrass putting green with the following treatments: mowing the plot once per day (1x), double mowing the plot (2x; covering the entire plot with the mower twice each day), 1x mowing and a treatment of trinexapac-ethyl at 0.04 kg a.i. per ha, 2x mowing and a treatment of trinexapac-ethyl at 0.04 kg a.i. per ha, 1x mowing and a treatment of paclobutrazol (0.28 kg of a.i. per ha) and 2x mowing and a treatment of paclobutrazol (0.28 kg of a.i. per ha) with each of these treatments replicated four times. The mowing height on all treatments was 0.125 inches. Data were collected twice daily 8-hours apart, which included volumetric water content (%VWC), surface firmness with a TruFirm device, traditional green speed with a Stimpmeter, and a GS3 roll test and surface drop test. Digital images were also collected to record changes in turfgrass cover. The study mimicked a golf tournament and lasted for four days.

Data collection presented here is from 2025.

Results and Conclusions

Due to space restrictions, only select data will be shared. There were no differences between mowing the plot 1x or 2x in ball roll distance for either the Stimpmeter or the GS3 devices. Significant differences existed between plant growth regulator treatments for both devices used to measure ball roll distance. When measuring with a Stimpmeter, not using a plant growth regulator (268 cm) offered the lowest ball roll distance, while using trinexapac-ethyl (281 cm) offered the greatest ball roll distance, and paclobutrazol (273 cm) was greater than not using a plant growth regulator for ball roll distance it was less than trinexapac-ethyl. When ball roll distance was measured with a GS3, trinexapac-ethyl had a greater distance than not using a plant growth regulator and paclobutrazol, however, there were no differences between the paclobutrazol and not using a plant growth regulator. More data is needed to see if various plant growth regulators will make a difference in ball roll distance when measured with the GS3 device.

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Table 1. The effect mowing frequency and plant growth regulator use (PGR) on Stimpmeter ball roll distance (Stimpmeter; cm), GS3 ball roll distance (GS3 Speed; cm), in Ames, IA, in 2025.

Treatments	Stimpmeter[a]		GS3 Speed[b]	
1x[c]	273	NS[d]	285	NS
2x[e]	275	NS	282	NS
No PGR[f]	268	c	279	b
TE[g]	281	a	289	A
Pac[h]	273	b	283	b

[a]Stimpmeter was measured as the average ball roll distance (cm) of three Titleist® Pro V1 golf balls rolled in two directions using a Stimpmeter.
[b]GS3 Speed was measured as the average ball roll distance (cm) of three rolls of the USGA GS3 smart golf ball rolled in two directions using a Stimpmeter.
[c]1X is single mowing event with a reel mower at 3 mm conducted in the morning.
[d]NS is not significant at the 0.05 level of significance.
[e]2X is double mowing event with reel mower at 3 mm conducted in the morning.
[f]PGR is plant growth regulator.
[g]TE is Tinexapac-ethyl (Primo Maxx, 0.04 kg of a.i. ha^{-1}) applied with a CO_2 pressure sprayer at a carrier volume of 407.5 L ha^{-1}.
[h]Pac is paclobutrazol (Trimmit, 0.28 kg of a.i. ha^{-1}) applied with a CO_2 pressure sprayer at a carrier volume of 407.5 L ha^{-1}.