Rollin’, rollin’, rollin’

Lightweight rollers can be used frequently to enhance putting green speed.

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Superintendents often use lightweight rollers to increase green speed for tournament play. However, many are still reluctant to embrace regular roller use because of concerns that frequent rolling may cause root-zone compaction, bruise turf leaf tissue (thereby diminishing turf quality) and spread turfgrass diseases by mechanical means.

Impact of frequent rolling

During the 1990s, research performed at North Carolina State University (NCSU), Pennsylvania State University (PSU) and Michigan State University (MSU) considered the impact of season-long rolling on green speed, soil compaction and turfgrass quality.

At PSU, putting green research plots having USGA-recommended sand or native-soil root zones were rolled zero, one or two times per week. Rolling did not diminish turfgrass quality or soil infiltration and did not increase soil compaction (1).

MSU researchers rolled creeping bentgrass (*Agrostis palustris*) greens grown on native soil and on plots constructed according to USGA recommendations with 80:20 and 80:10:10 root-zone mixes three times per week from 1995 to 2000. Putting greens on all three soil types were sand-topdressed every two to three weeks throughout the growing season. Results from the study showed no significant difference in turf quality, soil compaction or water infiltration compared with putting green plots that had not been rolled (5).

At NCSU, creeping bentgrass plots were rolled zero, one, four and seven times per week. As with the PSU study, plots rolled once a week showed no reduction in turfgrass quality. However, rolling four and seven times per week did decrease turfgrass quality on plots with either USGA-recommended sand root zones or with native-soil root zones. During the first year of the two-year study, soil compaction also increased on the native-soil greens rolled four and seven times per week (3). Because some superintendents like to roll greens daily during a tournament, it is important to note that the loss in turfgrass quality attributed to rolling four and seven times per week was not immediate and was not apparent for at least three weeks (6).

Given the results of the three studies, putting surfaces on a frequent sand-topdressing program can be safely rolled no more than three times per week.

Green speeds

In general, putting greens that have been rolled are faster than putting greens that have not been rolled. One rule of thumb is that the speed of a rolled green is 1 foot (0.30 meter) greater on the day of rolling and at least 6 inches (15.24 centimeters) greater on the day after rolling. Because golfer surveys indicate

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**Figure 1.** Lightweight rollers used in the Michigan State study included (left to right) True-Surface Vibratory Roller (Turfline Inc.) and four sidewinder units, including units by Salsco and Smithco, the DMI Speed Roller and the Tru-Turf Roll ‘n’ Slice.

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**KEY points**

- **Lightweight rolling** can significantly enhance green speed.
- **Putting greens** that receive frequent sand topdressing can be safely rolled three times per week without damaging turf.
- **Excessive thatch** can reduce the duration of the increases in green speed expected from lightweight rolling.
- **Golfers** should be able to detect increases in green speed on the day of rolling and the day after.

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that golfers cannot detect a difference in green speed of less than 6 inches (15.24 centimeters) (4), then rolling three days per week (every other day) results in noticeably faster green speeds six days per week.

Conclusions of 1990s research

Research results from the 1990s found that greens receiving light, frequent sand topdressing and lightweight rolling three times per week had:
• no significant decrease in turfgrass color or quality
• green speed an average of 1 foot (0.30 meter) greater on the day plots were rolled
• green speed an average of at least 6 inches (15.24 centimeters) greater the day after plots were rolled
• reduced dollar spot severity
• increased root growth in the sand-topdressing layer
• less localized dry spot
• fewer broadleaf weeds

Today’s rollers

The conclusions from 1990s lightweight rolling studies have certainly played a part in the increased use of rollers on golf courses. Today, however, dedicated lightweight rollers come in a variety of shapes, sizes and weights, and the only similarity among many of them is that they are manufactured for rolling putting greens (Figure 1). Do the conclusions from the ’90s apply to today’s machinery?

To address this question, the Michigan Turfgrass Foundation and several lightweight roller companies co-funded a two-year study, beginning in 2002, to address turfgrass color and quality, water infiltration, soil compaction and green speed on plots rolled with different roller types.

Rollers and green speed

At MSU, a green speed study was initiated on a Providence creeping bentgrass green mowed six days per week at 0.125 inch (3.2 millimeters) with a Toro walk-behind mower. The root zone was built according to USGA recommendations, and the site was sand-topdressed every two weeks for the duration of the study. Nitrogen inputs were minimal, with the plots receiving a foliar application of 0.10 pound nitrogen per 1,000 square feet (0.05 grams/square meter) every two weeks during the growing season.

Frequency

Because previous research had concluded that lightweight rolling four days a week could lead to detrimental effects on the turfgrass and underlying root zone and that rolling three times per week was safe (given the greens were on a topdressing program), it was decided to roll every other day throughout the season. At that frequency, greens were rolled three times one week and four the next on an alternating basis throughout the season. Given our rule of thumb that lightweight rolling noticeably increases green speed the...
day of and the day after the rolling treatment, a frequency of every other day would lead to noticeably increased green speeds every day of the week.

Rollers

In this study, five different rollers represented the main types of lightweight rollers on the market (Figure 1). Lightweight rollers included in the study were the True-Surface Vibratory Roller (Turfline Inc.) and four sidewinder units, including the Salsco and Smithco units each having two rollers, the DMI Speed Roller with three rollers, and the Tru-Turf Roll ‘n’ Slice, which has four rollers. The study included a check plot that was not rolled but was mowed six days per week and another plot that was not rolled but double-cut six days per week.

The study

Excessive thatch

For the first two weeks of the study, Stimpmeter measurements were obtained from the plots nearly every day. On the day plots were rolled, every lightweight roller noticeably and significantly increased green speed compared to the check plot, which was not rolled. However, the day after rolling, green speed was not significantly different for plots that were rolled and those that were not. Perplexed by the results, we searched for a possible cause for the lack of residual green speed and discovered an excessive amount of thatch (more than 1 inch [25.4 millimeters] thick) associated with the Providence creeping bentgrass turf.

Obviously, the sponginess caused by an excessive thatch layer could affect residual green speed attributed to lightweight rolling. Therefore, the site was put on an aggressive thatch-reduction program and, as the thatch diminished (over several months), the residual green speed attributed to lightweight rolling increased. Granted, the MSU plots had 1 inch (25.4 millimeters) of thatch, which would be excessive on an actual putting green. After the thatch was reduced to approximately ½ inch (12.7 millimeters), the increased green speed attributed to lightweight rolling lasted the day of rolling and the day after.

Green speeds

Table 1 shows the annual average increases in green speed attributed to the different rollers and double-cutting on the day plots were rolled and on the day after rolling. Lowercase letters indicate statistical significance. Values followed by the same lowercase letter in each column are not significantly different (that is, they are considered equal). The lowercase letters have no meaning going from left to right in the table, but are only meaningful in each column.

A comparison of the season averages for 2002 and 2003 on the day plots were rolled indicates that each rolling treatment varied by no more than 1 inch (2.54 centimeters). For example, the Speed Roller increased green speed 20 inches (50.8 centimeters) on the day plots were rolled in both 2002 and 2003, and the True-Surface Vibratory Roller increased green speed by 14 inches (35.6 centimeters) in 2002 and by 13 inches (33.02 centimeters) in 2003. Both results are noticeable accelerations in green speed.

Compared to the check plot, all other plots showed significantly increased green speed the day after the rolling treatment in both 2002 and 2003. Although all the data were statistically significant in 2002, only the Speed Roller and the Smithco roller averaged an increase in green speed that could possibly be detected by the average golfer on the day after rolling. As stated earlier, the lack of residual green speed in 2002 was attributed to a 1-inch (25.4-millimeter) thatch layer. As the thatch thickness was reduced to ½ inch (12.7 millimeters), all rolling treatments resulted in meaningful increases in green speed the day after rolling in 2003. In short, once the thatch was brought under control, all rollers included in the study increased green speed by more than a foot (0.30 meter) on the day of rolling and retained more than 6 inches (15.24 centimeters) of that increase the day after rolling.

The rule of thumb that superintendents can expect an average increase in green speed of 1 foot (0.30 meter) on the day greens are rolled is contradicted by the results of this study as some of the rollers resulted in an average increase in green speed closer to 1½ feet (0.45 meter). However, the differences among the green speeds the rollers generated may not be as great as they appear. Given that all the lightweight rollers produced green speed increases between the two extremes, agronomically speaking, there is little meaningful difference between the roller types and the impact they have on green speed.

Double-cutting

Double-cutting six days per week was included in the study to compare and contrast the differences in the two cultural practices and the impact each had on green speed and the turf. Although there were clearly differences in green speed between double cutting and lightweight rolling, it is easiest to conclude that both cultural practices increased green speed significantly and meaningfully. The biggest take-home message is that lightweight rolling every other day and double-cutting every day produce simi-
lar green speed increases. Lightweight rolling every other day is less labor-intensive than double-cutting every day, and less wear and fewer hours on the mower are required if a lightweight rolling program is followed in place of double-cutting every day.

In the first year of the study, the double-cut plots had the lowest turfgrass quality because of scalping that apparently was exacerbated by the thatch on the plots. However, scalping diminished as thatch thickness decreased, and double-cutting did not reduce turfgrass quality during the second year. None of the treatments decreased turfgrass color, quality, bulk density (soil compaction) or water infiltration compared to the check plot, which was not rolled and mowed only once (Figure 2).

Conclusions
Long-term lightweight rolling studies lead to the following conclusions.

• On native-soil creeping bentgrass greens that are on a frequent sand-topdressing program, rolling three times per week is the highest frequency that I can confidently recommend.

• On predominantly sandy greens that are on a frequent sand-topdressing program, a rolling frequency of every other day is the highest that I can recommend.

• Given the first two points, lightweight rolling should not decrease turfgrass color or quality or water infiltration, and it should not increase soil compaction.

• Thatch thickness can negatively affect residual green speed. In the MSU study, ½ inch to 1 inch (12.7-25.4 millimeters) of thatch reduced residual green speed the day after a rolling treatment.

• Lightweight rollers can be expected to produce differences in green speed that will be detected by golfers on the day the greens are rolled and the following day as long as thatch is not too thick.

• Green speed increases from lightweight rolling every other day will be the same as or greater than green speed increases from double-cutting every day.

Closing comments
Lightweight rolling three times a week on plots on a frequent sand-topdressing program has resulted in far more benefit than harm (Figure 3). Superintendents have displayed a lot of imagination in using lightweight rollers. Some courses raise mowing heights in the heat of the summer and roll every other day to maintain the green speeds produced by lower cutting. Other courses roll every day just before and during the club championship and/or important golf outings to increase green speed, and some superintendents roll (usually with vibratory rollers) following a sand-topdressing application to help work in the sand.

No matter how greens rollers are being used, it seems certain that more superintendents would agree with the 1922 comments of W.S. Harban (2): “I cannot conceive how a perfect putting surface can be developed or maintained without rolling,” and “I do not believe in rolling as a mere fad, but do think there are times when it is indispensable to make, keep, and protect a proper turf and surface on greens.”

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References