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DMI

SPEEDROLLER

GREEN SPEED/AGRONOMIC

HEALTH STUDY

Conducted by: Thom Nikolai, PhD.
Hancock Turfgrass Research Center at
Michigan State University - 2005

dmi diversified manufacturing incorporated
410 Ohio Street · Lockport, NY 14094 · (716) 434-5585 · FAX (716) 434-1757
P.O. Box 472 · Lockport, NY 14095-0472 · www.dmimfg.com

Introduction

Six-years ago the vast majority of an audience attending my green speed presentations did not own and/or owned and rarely used their rollers. When I currently poll my audiences more individuals have a roller and use them 3 to 4 times/week based mainly on past research results obtained at Michigan State University. Unfortunately, there are still more naysayer's than advocates of rollers due in part in part to their ignorance of research and real-world efforts and years of brain-washing with the axiom "speed kills".

Fears of adopting a rolling program are focused upon the misconceptions that rolling increases compaction, decreases infiltration, and adds to the stress upon the putting surface. However, the only negatives regarding increased compaction or decreased infiltration ever reported from light-weight roller research were performed on plots double rolled 4 and 7 times per week. The take-home message from that research is that rolling at a frequency more times than there are days in a week can have a negative impact on the underlying root zone.

Early research with rollers (i.e. research performed within the last 12-years) has primarily focused on finding safe rolling frequencies and identifying problems associated with rolling. The objective of this study is different as it initiates the identification of alternative ways that golf course superintendents can utilize a roller to promote turfgrass health and playability.

Materials & Methods

The DMI Speedroller green speed/agronomic health study was initiated May 23, 2005 at the Hancock Turfgrass Research Center at Michigan State University on a creeping bentgrass green. The research plot root zone was a native "push-up" style soil green with under a half an inch of that accumulation. Plots were single or double-mowed 6-7 times per week with one of two John Deere 180 walk behind green mowers bench-set at 0.125 and 0.156-inch. Reel to bed-knife contact was checked weekly as was the height of cut and the bed-knifes were changed and relief grinded once during the study.
All rolling treatments were applied with the DMI Speedroller.

Treatments in the study included:

1) Mowed daily at 0.125-inch.
2) Mowed daily at 0.125-inch and DMI Speedrolled every other day.
3) Alternate mowed at 0.125-inch and DMI Speedrolled on days not mowed.
4) Mowed daily at 0.125-inch and DMI Speedrolled daily.
5) Double-cut daily at 0.125-inch.
6) Mowed daily at 0.156-inch and DMI Speedrolled daily.

Green speed measurements were obtained with a Pelzmeter 17 times during the study. Nine measurements were obtained on days Treatments 1, 2, 3, and 5 were not rolled and

8 measurements were obtained on days all treatments were rolled except Treatment 1 (the check) and Treatment 5 (double-cut daily) . Measurements were obtained by releasing three golf balls in one direction, assessing the average distance they traveled, and rolling them back in the opposite direction from that spot. The six distances the golf balls traveled were than averaged and that distance is referred to as the green speed in this report, though surface smoothness would be a more appropriate term.

Infiltration ratings were taken in-situ with double-ring infiltrometers on each plot at the conclusion of the study along with Clegg impact tester measurements (surface hardness) The Clegg measures G-max and therefore the greater the number the harder the surface. Additionally, quality ratings were taken periodically (6 times) during the study. Turfgrass quality is a qualitative measure that combines turfgrass color and density. It is assessed on a scale of 1 to 9 with 1 implying dead, barren, or chlorotic turfgrass, 9 indicating excellent color and density, and 6 and above regarded as acceptable turfgrass color and density for a bentgrass putting green.

Plots were sand topdressed every 2-3 weeks for the duration of the study with a Ty-Crop QuickPass Topdresser towed behind a Toro Workman. Therefore, all treatments, regardless of mowing height, received the same amount of topdressing material.

Results

Since the objective of this study was to improve turfgrass health and playability it would be negligent to report green speed measurements obtained in this study without first considering the agronomic impact of the treatments on the turfgrass and root zone; therefore, the quality ratings for the season are reported in Table 1.

Of the six qualities ratings reported in Table 1 only two resulted in statistically significant differences. On June 2 Treatment 6 (mowed daily at 0.156 and rolled daily) received the highest quality rating and Treatment 2 (mowed daily at 0.125-inch and rolled every other day) resulted in the lowest quality. On July 13 Treatment 6 and Treatment 1 (check mowed daily at 0.125-inch) received a share of the highest quality rating and T 5 (double-cut daily) resulted in the lowest rating. Reported in the final column of Table 1 and 2 is the season average quality rating. Treatment 6 resulted in the highest average quality rating and Treatment 5 resulted in the lowest. However, it is important to note that all treatments on every date resulted in acceptable quality ratings (i.e. 6 and above) for a bentgrass putting surface.

In Table 2 the season's only disease count (brown patch) as well as the season ending infiltration rating and surface hardness rating are reported. None of the data is statistically significant, though it is interesting that Treatment 6 (rolled daily and mowed at 0.156-inch) resulted in no disease.

Finally, in the first column of Table 2 the change in green speed compared to the check plot is reported. Data is season average of statistically significant data. To clarify, during the season 17 green speed measurements were obtained but only 11-measurements were

statistically significant. For Treatment 1, 4, 5, and 6 those 11-measurements were averaged and are reported in Table 2. Treatments 2 and 3 are different however as there are days they are rolled and days they are not rolled. Therefore, statistically significant data is 5-measurements obtained from days plots were rolled and 6-measurements obtained form days they were not rolled.

In Table 3 and 4 all individual green speed measurements from days plots were rolled and not rolled are reported, respectively. There are several observations worthy of consideration in regards to the numerous green speed measurements obtained. Of the 11 statistically significant data Treatment 6 was the only treatment consistently resulting in a share of the greatest green speed. Conversely, Treatment 1, the check, always had the slowest green speed. Treatment 3 (alternating mowing and rolling daily) had comparable greens speed measurements as mowing daily (Treatment 1) on the days Treatment 3 plots were rolled and not mowed.

In Tables 5 and 6 the season average green speed measurements are reported as raw averages and as differences compared to the check, respectively. For purposes of communication Table 6 is the easiest way to interpret the data, and most notably the statistically significant data (columns 3 and 4) are the most accurate reflection for the season averages for Treatments 2 and 3 as compared to Treatment 1. In Table 2, the most accurate reflection of season averages for Treatments 4, 5, and 6 as compared to the Treatment 1 are presented.

Conclusions

A stated objective of this study was to identify alternative methods of utilizing rollers while increasing turfgrass quality. Clearly, we have begun to identify some interesting results.

While it is counter intuitive that plots mowed at 0.156 bench setting and rolled daily (T 6) could result in green speeds as fast as plots mowed at 0.125 and rolled daily (T4) the results from this particular study is hard to dispute. The data is consistent from all 11 statistically significant dates that green speed measurements were obtained that T6 resulted in speeds as fast as or faster than T4. I theorize that the improved quality of T6 indicates more turfgrass cover and therefore greater uniformity and surface smoothness.

For golf courses with the budget and manpower the aforementioned data indicate that rolling on a daily basis not only significantly increases green speed, but can lead to higher mowing heights and hence, increased turfgrass quality.

Many superintendents and golf course owners consider a roller a luxury piece of equipment that enhances green speed and is unaffordable. However, most have never considered the possibility of periodically rolling in place of mowing. Results from this study indicate that alternating mowing one day with rolling (without mowing) the next results in an increase in green speed on the day plots are mowed with no perceptible difference in speed the day plots are mowed. From this perspective a roller has the

ability to pay for itself by being used in place of mowing on a daily alternating basis. Clearly, if a golf course walk mows its green daily than alternating mowing one day and rolling the next will free-up man-hours to perform more tasks. Additionally, no matter the style of mower a golf course uses the care and upkeep of rollers incurs less time and cost than maintenance of mowers. Therefore, it seems possible that alternating mowing and rolling during portions of a season can, in the long-run, pay for itself and results from this study indicate no negatives from this practice.

There are numerous ways a roller can be utilized and this study is helpful is communicating the many ways one can be utilized.

Bullet Points from DMI Speedroller Study 2005

- Plots mowed daily at a 0.156-inch bench setting and rolled daily resulted in:

  a. Significantly faster green speeds than plots mowed daily at 0.125-inch bench setting
  b. Better turf quality than plots mowed daily at 0.125-inch bench setting
  c. No significant difference in water infiltration (given plots were on a sand topdressing program)
  d. No significant difference in surface hardness
  e. No significant differences in disease.

- Daily alternating mowing and rolling (i.e. mow without rolling one day and roll without mowing the next day) resulted in:

  a. No differences in turfgrass quality in Michigan and increased quality in Tennessee compared to plots that were mowed daily and not rolled.
  b. Significantly faster green speeds on the day plots were rolled and not mowed compared to mowed only plots in Michigan with no differences in green speed reported in Tennessee.
  c. No significant decrease in water infiltration (given plots were on a sand topdressing program)
  d. No increase in surface hardness.
  e. No significant differences in disease.

- Mowing daily at 0.125-inch and rolling every other day compared to double-cutting daily at 0.125-inch resulted in:

  a. Significantly faster green speeds on the day plots were rolled.
  b. No difference in green speed on the day plots were not rolled.
  c. No significant differences in turfgrass quality.
  d. No significant differences in water infiltration.
  e. No significant differences in surface hardness.
  f. No significant differences in disease.

- Rolling daily on plots mowing daily at 0.125 compared to double-cutting daily at 0.125-inch resulted in:

  a. Significantly faster green speeds (8” on average) on the rolled plots compared to the double-cut.
  b. Significantly better turfgrass quality on the rolled plots.
  c. No significant differences in water infiltration.
  d. No significant differences in surface hardness.
  e. No significant differences in disease.

- Single cutting daily at 0.125-inch compared to double cutting daily at 0.125-inch resulted in:

  a. An average increase in speed of 7-inches from double cutting
  b. A decrease in turfgrass quality from the double-cutting
  c. No significant differences in water infiltration.
  d. No significant differences in surface hardness.
  e. No significant differences in disease.

- Rolling daily on plots mowed daily at 0.125 compared to daily mowed at 0.125-inch resulted in:

  a. An average increase in speed of approximately 15” on the rolled plots.
  b. No significant differences in turfgrass quality.
  c. No significant differences in water infiltration.
  d. No significant differences in surface hardness.
  e. No significant differences in disease.

- Rolling daily on plots mowed daily at 0.156 compared to daily mowed at 0.125-inch resulted in:

  a. An average increase in speed of approximately 22” on the rolled plots.
  b. Significantly greater turfgrass quality on the rolled plots.
  c. No significant differences in water infiltration (given plots were on a sand topdressing program)
  d. No significant differences in surface hardness.
  e. No significant differences in disease.

- Rolling daily on plots mowed daily at 0.156 compared to rolling daily on plots mowed daily at 0.125-inch resulted in:

  a. An average increase in speed of approximately 7” on the plots mowed at 0.156-inch.
  b. Significantly greater turfgrass quality on the plots mowed at 0.156-inch.
  c. No significant differences in water infiltration.
  d. No significant differences in surface hardness.
  e. No significant differences in disease.

Table 1.

DMI SpeedRoller 2005 Quality Ratings on a scale of 1-9 1 = chlorotic or poor and 9 = excellent and 6 and above = acceptable.							
TREATMENTS	June 2	June 16	June 24	July 6	July 13	August 5	Season Average
1. Mowed @ 0.125 daily	7.3 b	6.3	7.3	7.7	8 a	7.3	7.3 b
2. Mowed @ 0.125 daily & DMI rolled every other day	6.3 c	6.3	6.7	7.3	7 bc	7.0	6.8 cd
3. Alternate mowed @ 0.125 & DMI rolled	7.0 bc	6.7	6.3	7.0	7.6 ab	7.3	7.0 bcd
4. Mowed @ 0.125 daily & DMI rolled every day	7.0 bc	6.7	7.0	7.3	7.6 ab	7.3	7.2 bc
5. Double cut @ 0.125 daily	7.3 b	6.0	6.3	7.0	6.6 c	7.0	6.7 d
6. Mowed @ 0.156 daily & DMI rolled every day	9.0 a	7.3	7.3	7.7	8 a	8.0	7.9 a
Probability	0.01	NS**	NS	NS	0.01	NS	0.00
LSD @ 0.05	0.07				0.74		0.06

*Means in column followed by the same letter are not significantly different from one another using the LSD mean separation test.
** NS implies not statistically significant within a probability of 0.05.

Table 2.

DMI SpeedRoller 2005 Individual and Season Average Ratings						
TREATMENTS	Season Average Green Speed Difference Compared to Check*****		Infiltration in Inches/Hour	Surface Hardness Measurements August 11	Brown Patch Data July 28	Season Average Quality Rating
1. Mowed @ 0.125 daily (Check plot)	-----		1.73	83	12	7.3 b
2. Mowed @ 0.125 & DMI rolled every other day	+ 17" DR**	----- DNR***	1.21	86	14	6.8 cd
3. Alternate mowed @ 0.125 & DMI rolled	+ 19" DR	+ 3" DNR	1.43	87	12	7.0 bcd
4. Mowed @ 0.125 daily & DMI rolled every day	+ 15"		1.52	88	6	7.2 bc
5. Double cut @ 0.125 daily	+ 7"		1.52	93	10	6.7 d
6. Mowed @ 0.156 daily & DMI rolled every day	+ 22"		1.08	85	0	7.9 a
Probability			NS****	NS	NS	0.00
LSD @ 0.05						0.06

*Means in column followed by the same letter are not significantly different from one another using the LSD mean separation test.
**DR + day rolled
*** DNR = days not rolled
**** NS implies not statistically significant within a probability of 0.05.
***** Data obtained as season average from statistically significant data only.

Table 3.

DMI Speedroller 2005 Green Speed Data From the Days all Treatments Rolled Except Treatment 1 and 5.								
TREATMENTS	June 7	June 24	June 28	July 7	July 15	July 26	Aug 11	Aug 30
1. Mowed @ 0.125 daily	111 c	107 c	107	94 c	92 c	96 c	108	119
2. Mowed @ 0.125 daily & DMI rolled every other day	127 b	118 bc	112	108 b	105 abc	108 ab	115	127
3. Alternate mowed @ 0.125 & DMI rolled	125 b	124 ab	112	111 b	106 ab	109 a	117	129
4. Mowed @ 0.125 daily & DMI rolled every day	135 a	123 ab	114	112 ab	108 ab	112 a	116	129
5. Double cut @ 0.125 daily	120 b	111 bc	110	106 b	98 bc	102 bc	118	121
6. Mowed @ 0.156 daily & DMI rolled every day	140 a	133 a	120	122 a	119 a	108 ab	104	127
Probability	0.00	0.02	0.28	0.00	0.02	0.00	0.16	0.44
LSD @ 0.05	6.6	14.0	NS	10.3	13.5	6.4	NS	NS

*Means in column followed by the same letter are not significantly different from one another using the LSD mean separation test.
** NS implies not statistically significant within a probability of 0.05.

Table 4.

DMI SpeedRoller 2005 Green Speed Data From the Days Treatments 1, 2, 3, and 5 Not Rolled.									
TREATMENTS	July 1	July 6	July 8	July 12	July 14	July 22	July 27	Aug 2	Aug 12
1. Mowed @ 0.125 daily	97 b	96 b	88 d	94 c	86 d	94	94 b	102	106
2. Mowed @ 0.125 daily & DMI rolled every other day	97 b	98 b	92 cd	98 c	91 cd	95	99 ab	105	106
3. Alternate mowed @ 0.125 & DMI rolled	100 b	97 b	96 bc	104 b	97 bc	89	104 a	108	116
4. Mowed @ 0.125 daily & DMI rolled every day	105 b	101 b	102 b	112 a	103 b	93	105 a	114	114
5. Double cut @ 0.125 daily	107 ab	93 b	95 bcd	104 b	95 bcd	93	102 a	108	117
6. Mowed @ 0.156 daily & DMI rolled every day	118 a	114 a	114 a	115 a	114 a	98	106 a	104	111
Probability	0.02	0.02	0.00	0.00	0.00	0.21	0.05	0.24	0.14
LSD @ 0.05	11.8	10.9	7.7	5.3	10.4	NS**	8.05	NS	NS

*Means in column followed by the same letter are not significantly different from one another using the LSD mean separation test.
** NS implies not statistically significant within a probability of 0.05.

Table 5.

	Season Average Green Speed				
			Statistically Significant Data Only		
TREATMENTS	Day Rolled	Day T2& 3 Not Rolled	Day Rolled	T2& 3 Not Rolled	All Measurements Combined**
1. Mowed @ 0.125 daily	104 d	95 d	100 d	93 d	99 d
2. Mowed @ 0.125 daily & DMI rolled every other day	115 b	98 cd	113 b	96 cd	106 c
3. Alternate mowed @ 0.125 & DMI rolled	116 b	101 bc	115 b	99 bc	108 bc
4. Mowed @ 0.125 daily & DMI rolled every day	119 ab	105 ab	118 b	104 b	112 ab
5. Double cut @ 0.125 daily	111 c	102 bc	107 c	99 bc	106 c
6. Mowed @ 0.156 daily & DMI rolled every day	122 a	110 a	124 a	113 a	116 a
Probability	0.00	0.00	0.00	0.00	0.00
LSD @ 0.05	4.0	5.9	5.7	8.5	4.8

*Means in column followed by the same letter are not significantly different from one another using the LSD mean separation test.
** Includes statistically significant and non-significant data pooled for the annual average.

Table 6.

	Season Average Increase in Green Speed Compared to Check Plot				
			Statistically Significant Data Only		
TREATMENTS	Day Rolled	Day T2& 3 Not Rolled	Day Rolled	T2& 3 Not Rolled	All Data Combined*
1. Mowed @ 0.125 daily	------	------	------	------	-----
2. Mowed @ 0.125 daily & DMI rolled every other day	+ 9”	+ 3”	+13”	+ 3”	+ 7”
3. Alternate mowed @ 0.125 & DMI rolled	+12”	+ 6”	+15”	+ 6”	+ 9”
4. Mowed @ 0.125 daily & DMI rolled every day	+15”	+10”	+18”	+13”	+13”
5. Double cut @ 0.125 daily	+ 7”	+ 7”	+ 7”	+ 6”	+ 7”
6. Mowed @ 0.156 daily & DMI rolled every day	+18”	+15”	+24”	+20”	+17”

* Includes statistically significant and non-significant data pooled for the annual average..