Shockwave Aerification Performance Study

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Introduction

Athletic field safety is a growing concern on all levels from young children to professional sports. Finding time to close the field to relieve compaction is often difficult, but new machines offer a potential solution. The objective of this project is to evaluate the performance of a native soil Kentucky bluegrass (*Poa pratensis*) athletic field under simulated traffic subjected to various aerification methods and the Imants Shockwave. Safety parameters such as surface hardness and rotational resistance were tracked throughout the season to determine if any benefits exist to athlete safety between treatments. This is the first year of a two-year study.

Materials and Methods

Research is being conducted at the Iowa State University Horticulture Research Station on the Sports Turf Research Area on a native soil rootzone. The experimental design was a randomized complete block with three replications. The five treatments were an untreated control, hollow tine aerification, solid tine aerification, one pass with the Shockwave, and two perpendicular passes with the Shockwave. Treatments were applied during the 2017 growing season with simulated traffic beginning at the same time as the Iowa high school football season. Traffic was applied with a modified Baldree Traffic Simulator (BTS) and plots receive three simulated traffic events/week for nine weeks. Digital images were collected after every traffic event to track turfgrass performance with percent green cover. Percent green cover was determined using digital image analysis. Surface hardness, soil moisture, and shear vane rotational resistance were collected after every five simulated traffic events. Surface hardness was collected using a 2.25 kg Clegg Impact Soil Tester. Soil moisture was collected with the FieldScout TDR, and rotational resistance was collected with a TurfTec Shear Tester.

Results and Discussion

A significant date-by-treatment interaction was present, so data are presented by individual dates. Surface hardness values varied between treatments and rating dates with no real consistency (Table 1). As soil moisture decreased, surface hardness increased (data not shown). Hollow tine aerification treatments resulted in lower percent green cover than the control and Shockwave single pass on three of the six rating dates (Table 2). Perpendicular passes with the Shockwave also demonstrated significantly lower percent cover on three ratings dates.

No differences between treatments were reported for soil moisture (data not shown). Significant differences existed for rotational resistance between treatments after 5, 10, 20, and 25 games, with hollow tine treatments providing the least rotational resistance of all the treatments on these dates (data not shown). This study will be repeated in 2018 and recovery from traffic will be tracked each spring.

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Table 1. Effect of various cultivation treatments on Kentucky bluegrass under simulated athletic traffic on surface hardness, 2017.

	Number of simulated traffic events[1]					
Cultivation method	**0**	**5**	**10[7]**	**15**	**20**	**25**
Control[2]	55[8]	90	135	59	101	79
Hollow tine[3]	37	99	162	71	83	85
Shockwave 1x[4]	53	100	138	68	89	78
Shockwave 2x[5]	53	105	115	65	84	77
Solid tine[6]	46	99	102	50	83	78
LSD (0.05)[9]	7	18	19	11	30	9

[1]Simulated athletic events applied using a modified Baldree Traffic Simulator starting August 7, 2017.
[2]Control treatments did not receive any cultivation treatments.
[3]Hollow tine treatments were applied using a Toro Pro Core 648 with a 1.27 cm diameter tine on 7.62 cm x 7.62 cm spacing June 20, July 20, and August 23, 2017.
[4]Shockwave 1x treatment received one pass of the Shockwave set at 25-cm depth June 20, July 20, August 23, and September 12, 2017.
[5]Shockwave 2x treatment received two passes of the Shockwave set at 25-cm depth June 20, July 20, August 23, and September 12, 2017.
[6]Solid tine treatments were applied using a Toro Pro Core 648 with a 1.27 cm diameter tine on 7.62 cm x 7.62 cm spacing June 20, July 20, and August 23, 2017.
[7]Soil moisture values averaged below 30% on this date, much lower than other rating dates.
[8]Surface hardness values collected using a 2.25 kg Clegg Impact Soil Tester, units are expressed in GMAX.
[9]Means were separated using Fishers LSD.

Table 2. Effect of various cultivation treatments on Kentucky bluegrass under simulated athletic traffic on percent green cover, 2017.

	Number of simulated traffic events[1]					
Cultivation method	**0**	**5**	**10**	**15**	**20**	**25**
Control[2]	89[7]	97	93	52	52	40
Hollow tine[3]	88	73	65	39	42	31
Shockwave 1x[4]	88	93	83	46	48	38
Shockwave 2x[5]	86	95	74	41	40	30
Solid tine[6]	90	95	86	52	50	40
LSD (0.05)[8]	6.1	4.3	11.3	7.3	7.4	7.7

[1]Simulated athletic events applied using a modified Baldree Traffic Simulator starting August 7, 2017.
[2]Control treatments did not receive any cultivation treatments.
[3]Hollow tine treatments were applied using a Toro Pro Core 648 with a 1.27 cm diameter tine on 7.62 cm x 7.62 cm spacing June 20, July 20, and August 23, 2017.
[4]Shockwave 1x treatment received one pass of the Shockwave set at 25-cm depth June 20, July 20, August 23, and September 12, 2017.
[5]Shockwave 2x treatment received two passes of the Shockwave set at 25-cm depth June 20, July 20, August 23, and September 12, 2017.
[6]Solid tine treatments were applied using a Toro Pro Core 648 with a 1.27 cm diameter tine on 7.62cm x 7.62 cm spacing June 20, July 20, and August 23, 2017.
[7]Percent green cover as determined with digital image analysis.
[8]Means were separated using Fishers LSD.