

## GT Airinject Final Report Draft

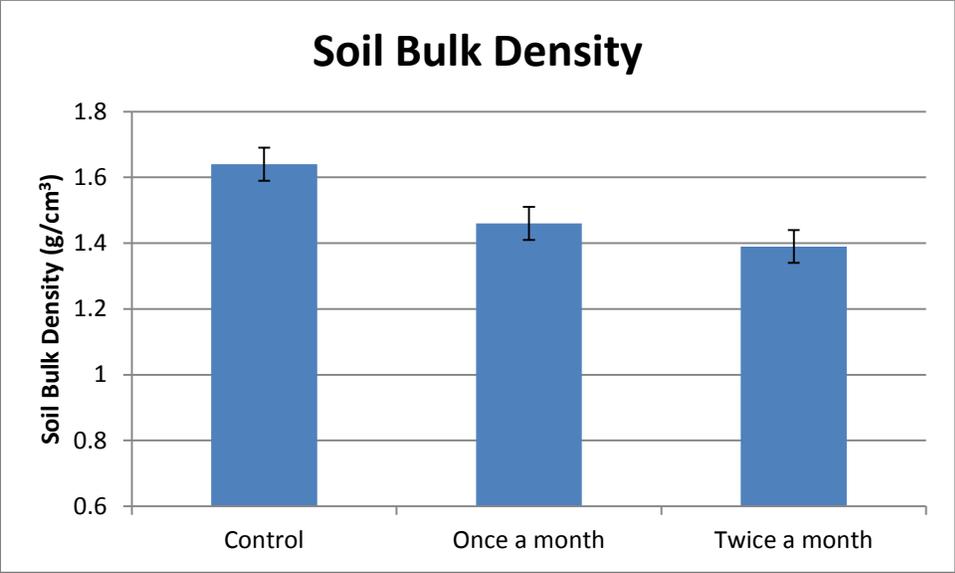
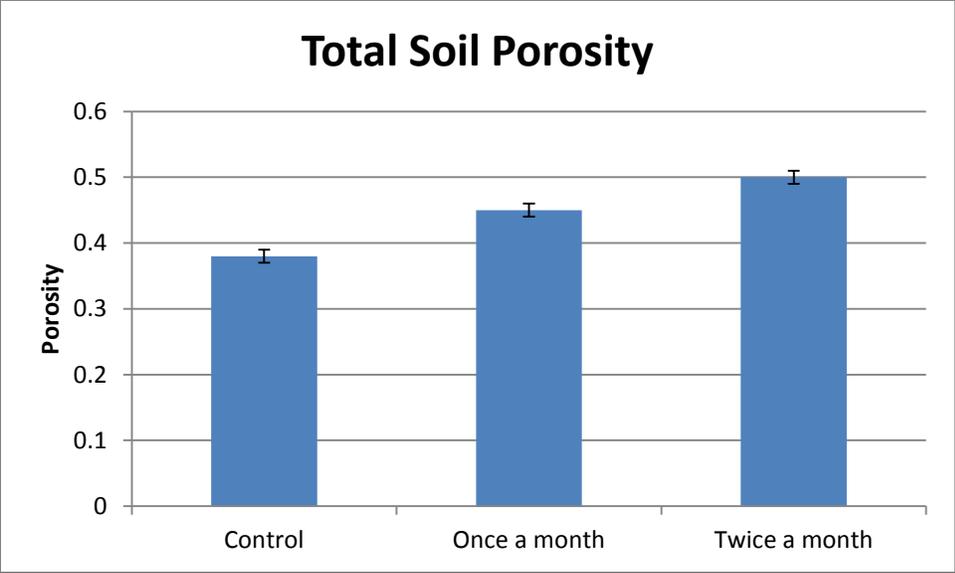
By Dr. John Sorochan and Kyley Dickson

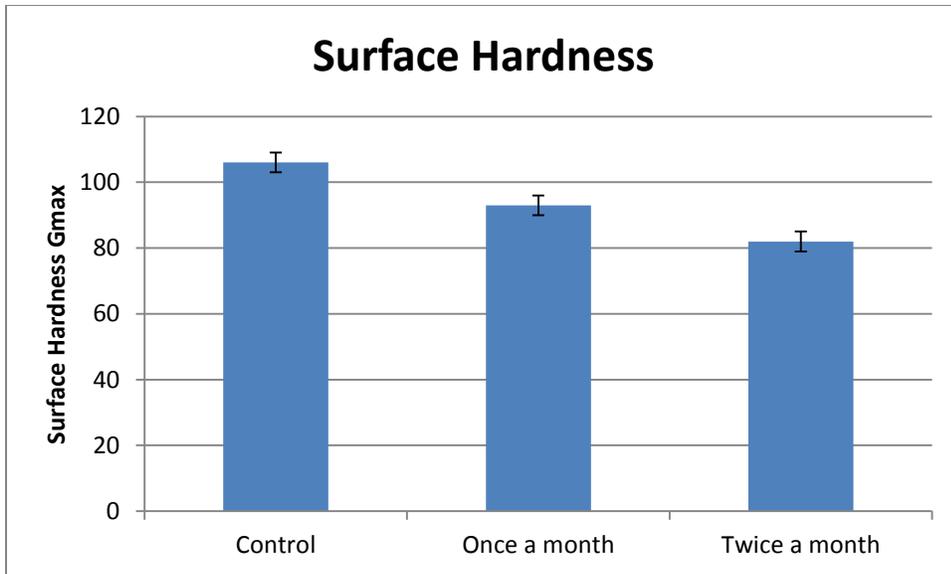
**Overview:** Five studies were completed at the University of Tennessee to better investigate the effect of the Air2g2 on soil compaction and to determine optimal application timing. Each of the five studies took place in Knoxville, TN from July to September 2014. Several tests were warranted to determine an understanding of this new air injection system.

**Study One:** Determination of soil characteristics and application interval of Air2g2 injection on a native soil (silt loam) bermudagrass athletic field

This study was completed on a local multi-use native soil (silt loam) athletic field with 'Tifway' bermudagrass. The purpose of this study was to determine the optimal application interval and the effect the Air2g2 has on soil characteristics. The treatments consisted of three treatments: Air2g2 applications once per month, Air2g2 applications two times per month, and an untreated control. The treatments were replicated three times from 1 July through 31 August. Data collection included: surface hardness, soil moisture, bulk density, particle density, porosity, percent green cover, dark green color index, color, and quality measurements. Soil cores were collected to determine soil physical properties at the start, middle, and conclusion of the study. Finally, surface hardness measurements were taken before and after each treatment application.

**Conclusions:** Air2g2 injections, reduced surface hardness by 21% (100 to 82 Gmax). Air2g2 injections did not affect soil moisture, percent green cover, dark green color index, color, quality, and particle density. However, Air2g2 injections reduced soil bulk density from 1.63 to 1.39 g/cm<sup>3</sup> and increased total soil porosity from 0.4 to 0.5. This suggests that the Air2g2 helps to reduce soil compaction by decreasing surface hardness. The reductions in soil bulk density and increase total soil porosity suggests that the Air2g2 injections increase macropore (airfilled) space.

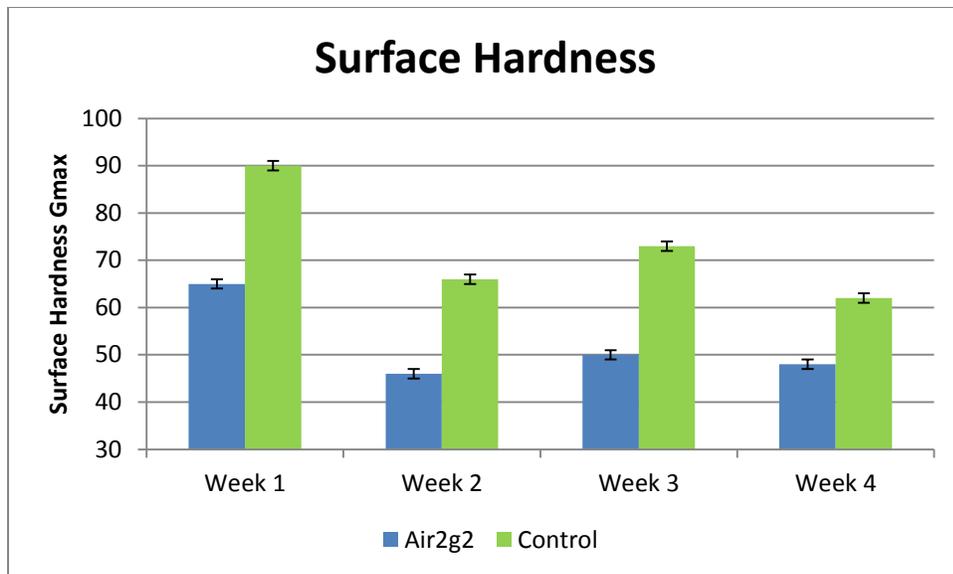




**Study Two:** Weekly application of Air2g2 on native soil (silt loam) to detect surface hardness reductions

This study was completed on a native soil (silt loam) 'Riviera' common bermudagrass mown at 7/8" with no irrigation. Treatments were weekly Air2g2 injections and an untreated control. The purpose of this study was to determine if weekly Air2g2 injections reduced surface hardness measurements. Based off of Study one findings, data suggested that Air2g2 injections two times per month were not enough to maintain reduced surface hardness measurements. Therefore, this study investigated weekly Air2g2 injections. This study had three replications of each treatment and was repeated four times throughout the month of August. Surface hardness and soil moisture measurements were collect to determine the duration of surface hardness reduction per application of the Air2g2.

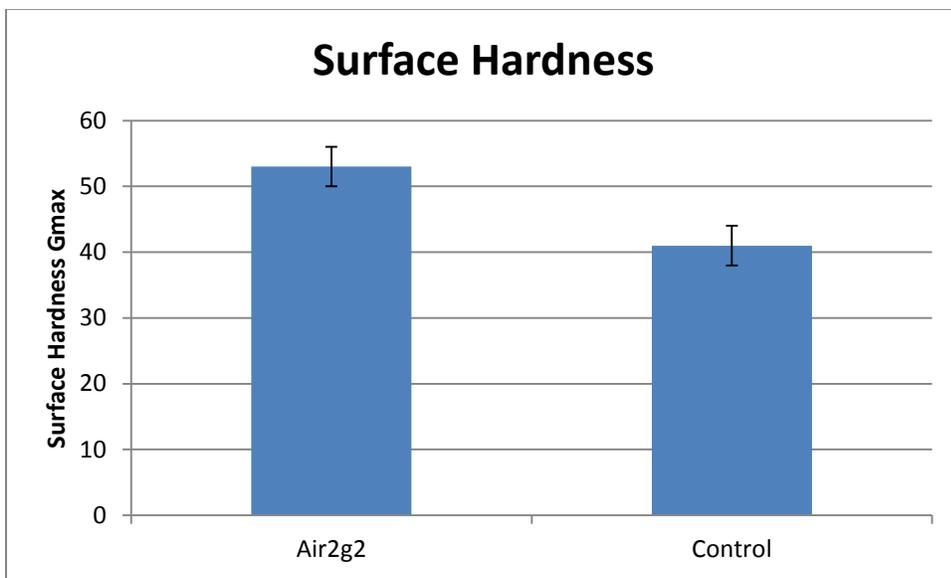
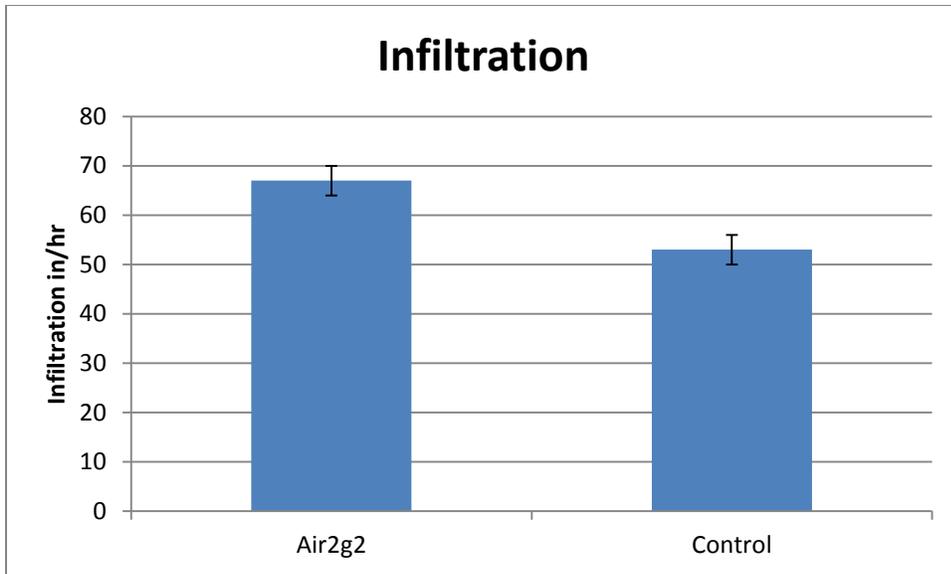
**Conclusions:** The initial reduction in surface hardness did not persist two weeks after Air2g2 injections . Weekly Air2g2 injections maintained a 19% reduction in surface hardness compared to the control plots. These results suggest that weekly Air2g2 injections are needed to maintain the reduction in surface hardness.



**Study Three:** Impact of weekly Air2g2 applications on a sand based bermudagrass athletic field

This study was completed on an athletic field built to USGA sand specifications with ‘Tifway’ bermudagrass. There were three replications of each treatment and they were applied twice a month in August. The treatments consisted of Air2g2 soil injections and an untreated control. Data collection included surface hardness, soil moisture, water infiltration, percent green cover, dark green color index, color quality, and turfgrass shear strength measurements. The purpose of this study was to see what effect the Air2g2 had on a sand based root zone.

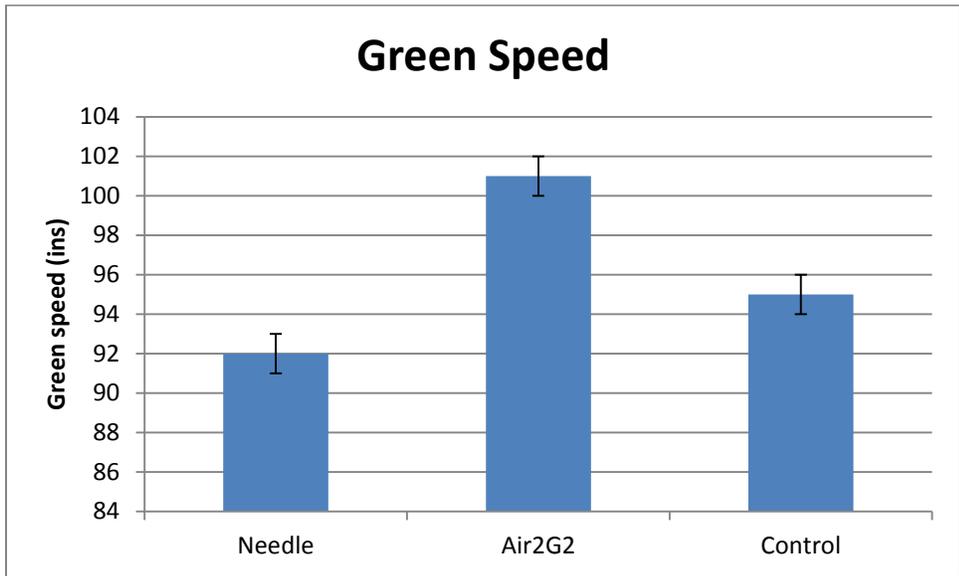
**Conclusions:** Initially, Air2g2 injections reduced surface hardness measurements from 52 to 37 Gmax using a Clegg Impact Surface Hammer. Turfgrass shear strength was not affected by Air2g2 injections. In addition, no differences were observed for soil moisture content. Also, no differences were found in percent green cover, dark green color index, and color, and quality measurements, respectively. However, Air2g2 injections increase water infiltration rates by 10” per hour. These findings suggest that the Air2g2 decreased the surface hardness and increased water infiltration rates on a sand based bermudagrass athletic field.



**Study Four:** Impacts on putting green speeds comparing the Air2g2, needle tine, and an untreated control on a ultra-dwarf bermudagrass putting green

Study two was complete on a sand capped ultra-dwarf bermudagrass putting green. This study compared the effect of needle tine versus the Air2g2 in how it affected green speeds. This study consisted of three treatments of a control with no applications, needle tine twice a month and Air2g2 applications twice a month. Green speeds were measured six times on each treatment at each rating date, before and after treatments were applied.

**Conclusions:** No reduction in green speeds was found with Air2g2 injections. Conversely, green speeds increased by six inches immediately following Air2g2 injections; while, green speeds decreased when needle tine treatments were applied. However, data collection to determine how long the increased green speeds lasted was not collected. Therefore, these results suggest that green speeds are not reduced following Air2g2 injections.



**Study Five:** Root zone temperature changes in a USGA creeping bentgrass putting green

Study one was completed on a sand based USGA spec 'A-1' creeping bentgrass putting green. This study measured soil temperature every thirty minutes after the injection of air, at nine injection sights. Three temperature probes were placed into the ground around each injection sight and monitored throughout the duration of the day. Treatments consisted of Air2g2 applications or no treatments applications. This study was repeated two times, with a week between each application.

**Conclusion:** There were no differences found between soil temperatures in both applications. This suggests that in the middle of the summer the Air2g2 has no soil temperature differences.

Anova table

Treatment	Temperature
Control	NS
Air2g2	NS

NS designates non-significant