Surface Measurements for Bermudagrass and Kentucky Bluegrass Grown on Four Root Zone Construction Types

A study conducted with Brock International to identify baseline values for natural turfgrass surface hardness characteristics

by

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Materials and Methods

Surface Composition

1. Kentucky bluegrass (cool-season) turfgrass on USGA Specification root zone
2. Bermudagrass (warm-season) turfgrass on USGA Specification root zone

Surface Root Zone Construction

1. ASTM Sand Specification
2. Silt Loam Native Soil
3. 6-inch Sand Cap system
4. USGA Sand Specification

Results

Surface Composition

- Clegg surface hardness values ranged from a GMAX of 61.5 to 43.1 on bermudagrass and 46.5 to 31.5 on Kentucky bluegrass (Fig. 1)
- Bermudagrass (80) provided a significantly higher surface hardness (GMAX) than Kentucky bluegrass (71) when tested with the F355 device (Fig. 2)

Surface Composition by Surface Root Zone Construction

- Clegg surface hardness measurements resulted in bermudagrass with a native soil rootzone and bermudagrass with a sand cap rootzone being a harder surface than Kentucky bluegrass regardless of rootozne, while bermudagrass grown over sand rootzones is not statistically different from Kentucky bluegrass grown over native soil or USGA sand (Fig. 1)
- No differences in surface hardness were detected with the F355 for rootzones

Fig 1. Clegg Surface Hardness interaction for Bermudagrass and Kentucky Bluegrass. Knoxville, TN August 2013

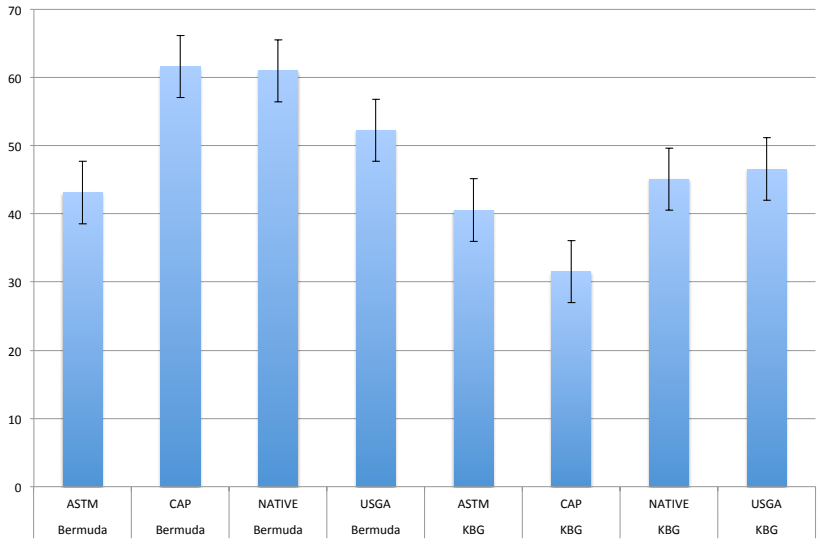
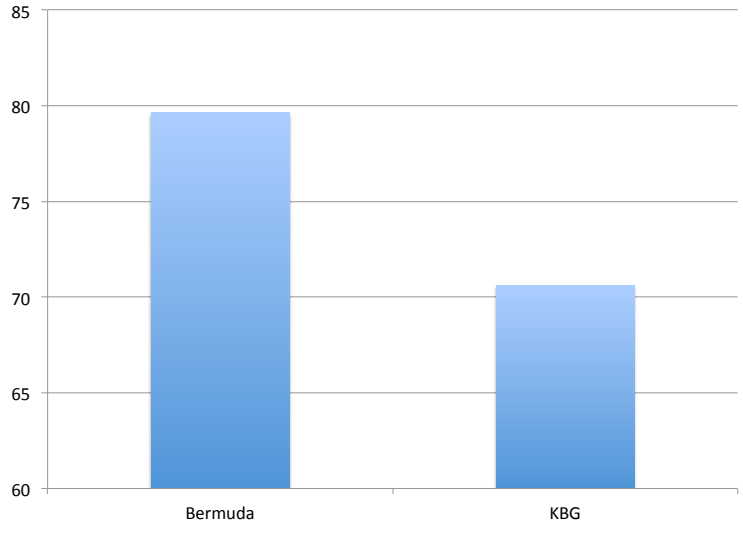


Fig 2. F 355 Surface Hardness main effects for Turfgrass Species.
Knoxville, TN August 2013



Results

Deltec Vertical Deformation

- The greatest vertical deformation was recorded on the Kentucky bluegrass over a sand cap rootzone (11 mm), no differences were found between KBG over sand cap rootzone and either bermudagrass or KBG over a native soil (9.3 and 9.7 mm). However, less vertical deformation were found between KBG sand cap rootzones and all other species and rootzones tested (Fig. 3.)

Deltec Force Reduction

- Force Reduction was the greatest on KBG sand cap plots (80) compared to all plots except KBG on ASTM sand rootzones and KBG on native soil rootzones. The least force reduction was on bermudagrass sand cap plots (Fig. 3)

Fig 3. Deltec Verticle Deformation for turfgrass type by root zone construction type interaction. Knoxville, TN August 2013

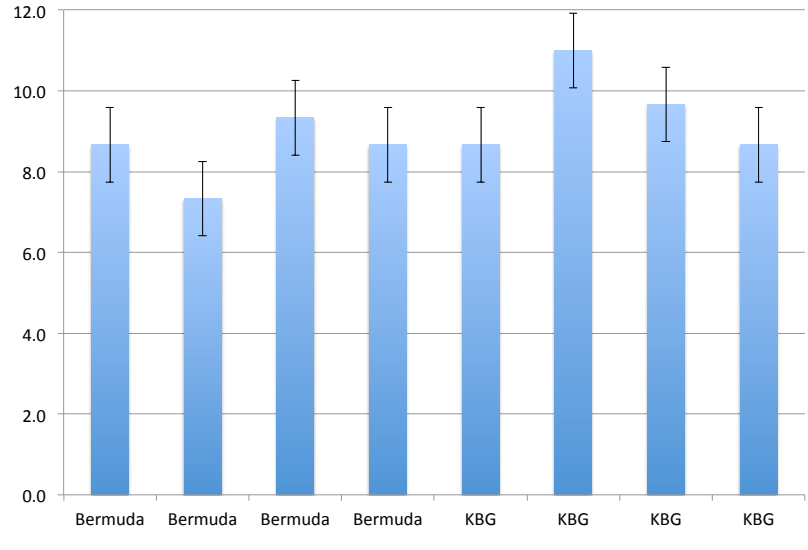


Fig 4. Deltec Force Reduction for turfgrass type by root zone construction type interaction. Knoxville, TN August 2013

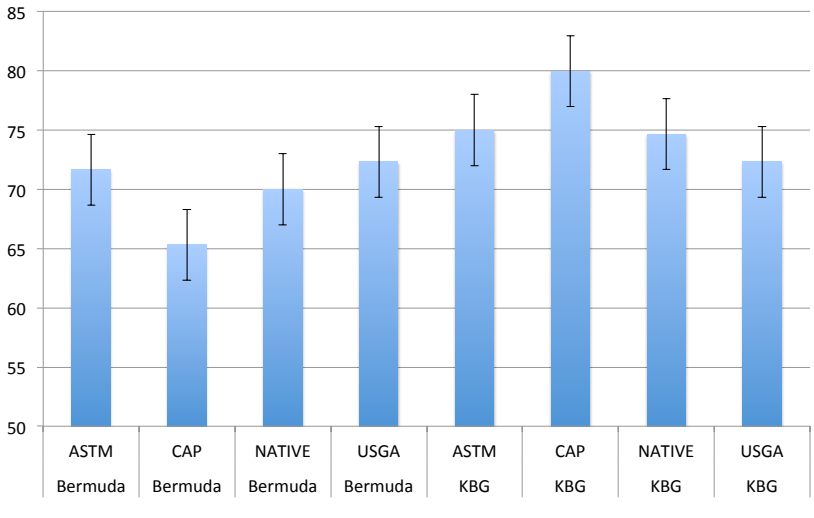
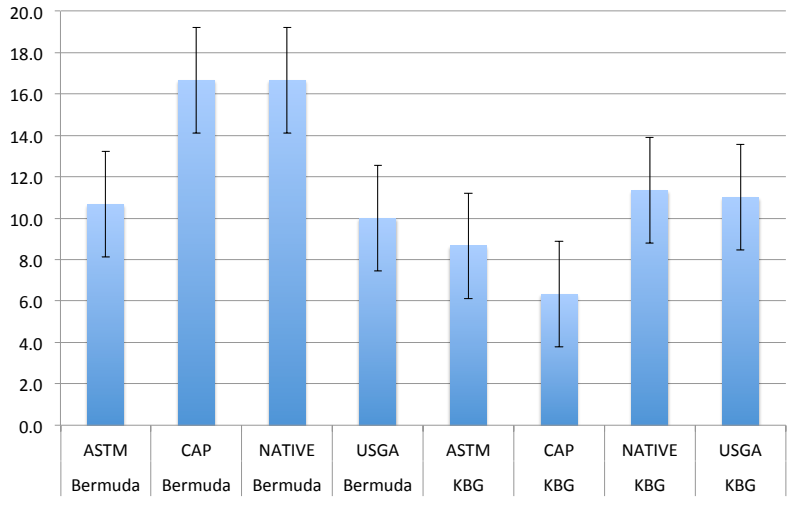


Fig 5. Deltec Energy Reduction for turfgrass type by root zone construction type interaction. Knoxville, TN August 2013



Results

Deltec Energy Reduction

- Energy reduction values were the highest on bermudagrass grown over sand cap plots as well as bermudagrass grown over native soil. All other turfgrass and rootzone combinations were not different from one another (Fig. 5)

Fig 6. F 1292 HIC main effects from a 1 m drop height. Knoxville, TN August 2013

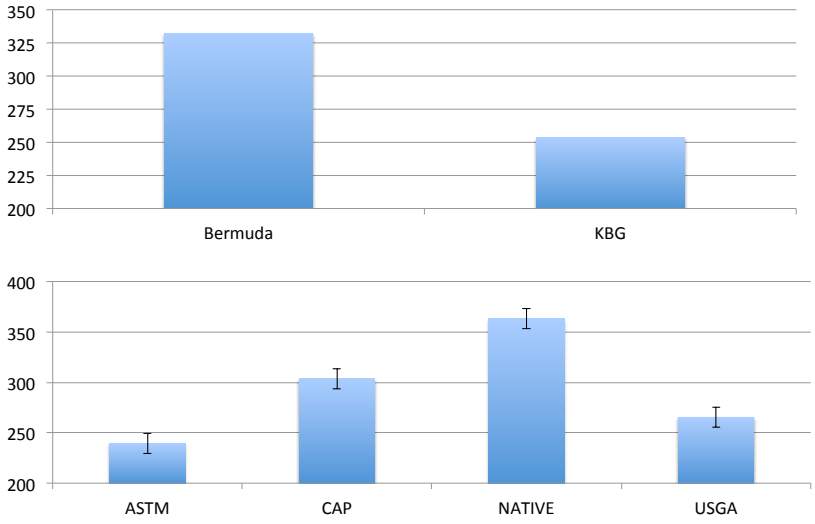
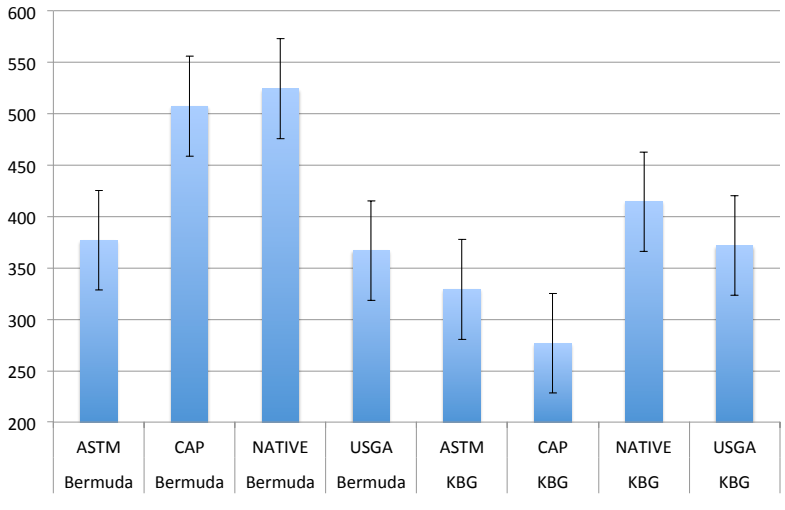


Fig 7. F 1292 HIC for turfgrass type by root zone construction type interaction from a 1.3 m drop height. Knoxville, TN August 2013



Results

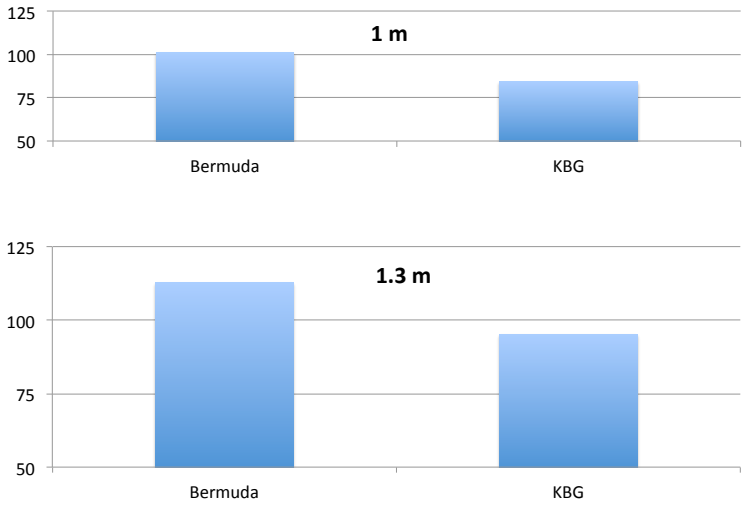
F 1292 HIC from 1 m

- Bermudagrass had a higher HIC (332) as compared to Kentucky bluegrass (254) (Fig. 6)
- Native soil rootzones (363) had a higher HIC than USGA sand rootzones (266) and ASTM rootzones (239), there were no differences between HIC values of native soil rootzones and sand cap rootzones (304) (Fig. 6)

F 1292 HIC from 1.3 m

- A significant turfgrass by rootzone interaction was detected
- Bermudagrass sand cap rootzones and bermudagrass native soil rootzones had higher HIC values than all other turfgrasses and rootzone combinations (Fig. 7)

Fig 8. F 1292 Gmax main effects from a 1 m and 1.3 m drop heights. Knoxville, TN August 2013



Results

F 1292 GMAX from 1 m and 1.3 m

- Bermudagrass had higher surface hardness values than Kentucky bluegrass for both drop heights
- Increasing drop height increased surface hardness of the surfaces
- No surface hardness differences were detected between rootzones

Results

- All surface and rootzones combinations are well below the National Football League mandated 100 GMAX threshold from testing with the Clegg
- Kentucky bluegrass turfgrass plots resulted in lower values than bermudagrass for most of the tests
- Kentucky bluegrass plots had significantly higher levels of volumetric water present the day of testing and can explain these differences