

Measuring sod strength of Kentucky bluegrass and Supina bluegrass

By John C. Sorochan and
John N. Rogers, III

The extent of root, rhizome, and/or stolon growth determines turfgrass sod maturity. In 1998, at Michigan State University, the Calrochan Sod Puller (CSP) was developed to measure the force necessary to tear a piece of sod.

The CSP uses a battery powered hydraulic pulley to provide a consistent pulling force, and is attached to a load cell.

In August 1999, sod strength measurements of different turves were collected from the Manderley turfgrass sod farms in Napean, Ontario, Canada. The objective of this investigation was to introduce the CSP as a method for determining turfgrass maturity.

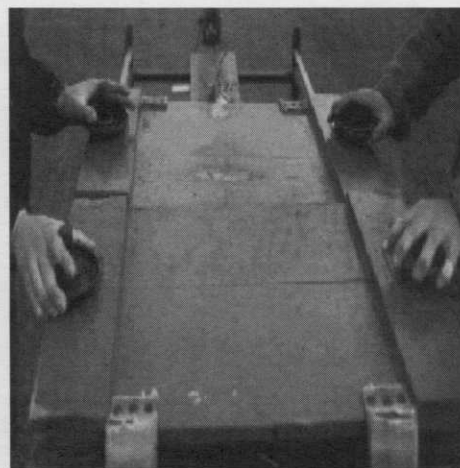
In short, sod strength measurements for Kentucky bluegrass increased with sod maturity and maintenance intensity. Results suggested that a minimum sod strength value of 38 pounds (17 kilograms) is necessary before Kentucky bluegrass sod (16 inches x one-half inch) is mature enough to harvest for commercial sod production. The consistency of the sod pull

measurements suggest that the CSP is a useful tool for evaluating turfgrass maturity. Applications to other turfgrass research, particularly establishment investigations, are warranted.

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One potentially fruitful area — given the increased sales of creeping bentgrass sod for golf course putting greens, tees, and fairways — is sod testing with the CSP on bentgrass. This could provide an important component to determine when the sod is ready for harvesting.

Thatch is a potential problem with the production and sale of creeping bentgrass sod. Testing with the CSP will provide sod producers with a quantitative value for determining when they can harvest creeping bentgrass sod early enough to avoid any thatch problems.



Early Michigan sod testers

Early sod testers

Many devices have been constructed to evaluate turfgrass strength and its relationship to sod maturity. Mature and harvestable sod depends on the extent of root, rhizome, and/or stolon growth (Rieke, et al., 1968).

The earliest sod strength tester known used a bucket with sand added to measure the force, in kilograms, needed to tear or break a piece of sod (Rieke, et al., 1968) (Figure 1).

Advanced sod stretchers used a winch as the principal stretching force (English and Rieke, 1971) (Figure 1). Unfortunately, these sod stretchers have potential for imprecise measurements due to the inconsistency of the sod stretch measurements (Burns and Futral, 1980).

In 1980, Burns and Futral developed a method to measure sod strength using the Instron universal testing instrument (Mod 1130, Instron Corporation, Canton, MA). However, Burns and Futral (1980) determined that the Instron is too expensive to use solely for sod testing in most programs.

In 1998, at Michigan State University, the Calrochan Sod Puller (CSP) was developed to measure sod strength (Figure 2). The design of this component is reflective of the earliest Michigan sod strength testers developed in 1968 and 1971, where the testing involves placing a piece of harvested sod on a horizontal surface with one-half fixed.

Unlike the earlier versions, the CSP braces the sod between two components by clamping down four 10-cm wide metal

bars, each threaded with 29 8-mm metal golf spikes.

A battery powered hydraulic pulley, providing a consistent pull, performs the force required to tear a piece of sod. Actual sod strength is measured in pounds (or kilograms) using a Chatillon digital force load cell instrument model DFI (Chatillon Force Measurement, Greensboro, NC) to measure the peak force value.

The objective of this article is to introduce a quantitative method for determining turfgrass tearing strength. A second objective is to establish an acceptable minimum sod strength value to determine turf maturity for harvesting.

Materials and methods

On Aug. 28, 1999, random sod samples were harvested from five Kentucky bluegrass farms and two Supina bluegrass farms in Napean, Ontario, Canada. The Kentucky bluegrass sod farms were seeded as a blend of Alpine (25%), Eclipse (25%), Regent (25%) and Welcome (25%), and were harvested for testing at 276, 353, 355, 375 and 395 days after seeding (DAS).

The Supina bluegrass was seeded as a monostand of Supranova and harvested at 360 and 379 DAS. The Supina bluegrass harvested at 360 DAS was established in Conwed Sodnet (Conwed Plastics, Minneapolis, MN) to provide additional strength.

All sod farms consist of a native soil ranging from sandy loam to sandy clay loam soils, with the exception of the Kentucky bluegrass harvested at 395 DAS which was grown in peat. All sod farms with the exception of the Kentucky bluegrass harvested at 276 DAS were currently in production for commercial harvesting.

Management practices on all sod farms tested were different in terms of intensities for fertilizer, mowing and irrigation. Those differences in rates of nitrogen applied, irri-

Actual sod strength is measured in pounds (or kilograms) using a Chatillon digital force load cell instrument model to measure the peak force value.



Sod puller unit (CSP)

TABLE 1. MANAGEMENT PRACTICE FOR KENTUCKY BLUEGRASS (KBG) AND SUPINA BLUEGRASS (SBG) SOD PRODUCTION, NAPEAN, ONTARIO, CANADA 1998-99

Species (age in days after seeding (DAS))	Nitrogen from seeding to harvest (lbs N per acre)	Irrigated	Mowing at 1 inch
KBG (276 DAS)	500	None	Every 3 days
KBG (353 DAS)	950	None	Every 3 days
KBG (355 DAS)	1500	Yes	Every 2 days
KBG (375 DAS)	1990	Yes	Every 2 days
KBG (395 DAS)	2240	None	Every 3 days
SBG (360 DAS)	1400	Yes	Every 2 days
SBG (379 DAS)	1400	Yes	Every 2 days

gation and mowing heights are outlined in Table 1.

Eight replications of the peak sod stretching measurements were collected, in kilograms, using the Calrochan Sod Puller. Sod stretching measurements for the non-washed samples were taken on Aug. 28, 1999, and washed sod measurements were taken on Aug. 29, 1999. Harvested sod measured 16 inches wide by one-half inch thick, and was pulled with a three-inch spacing between the clamp bars (Figure 2). Statistical analysis was determined at a 0.05 probability level using the SAS System for Windows.



Close up of sod on CSP

Building Sod Strength

Sod strength measurements for Kentucky bluegrass increased with sod maturity (Fig-

ure 3) and maintenance intensity (Table 1).

A turfgrass strength value of 38 pounds (17 kilograms) was established as a minimum value necessary to produce a harvestable sod (Figure 3.) This minimum value of 38 pounds was determined as a result of the sod strength tests from the Kentucky bluegrass sod farms harvested at 276 and 353 days after seeding (DAS). The sod harvested at 353 DAS was considered immature sod, but was strong enough for commercial sod production.

Conversely, the sod harvested at 276 DAS was considered too immature for handling and was not yet ready for commercial sod production.

Washed sod strength decreased significantly in two of the three Kentucky bluegrass and in one of the two Supina bluegrass sod farms tested (Figure 4). The soil removal process from the sod involves

As a result of the washing process, the size of the sod piece is increased to 30% to 50% of its original size.

pushing the soil from the underside of the sod through the top with high-pressure water.

As a result of the washing process, the size of the sod piece is increased by 30% to 50% of its original size. Removal of the soil



Sod pull at Manderley

and the increased stretching potentially weakens the sod, and therefore may contribute to the lower sod strength values obtained as compared to the sod with soil intact. (The actual length of the sod is increased by 30 to 50% when it is run through the washing process. The process of removing soil from sod actually stretches the sod at the same time.)

Consistency of measurements

The correlation and consistent trends obtained during this investigation suggests that the Calrochan Sod Puller is an excellent apparatus to measure turfgrass sod strength. Additionally, the consistency of the measurements obtained, as a result of the uniform pulling force of the CSP, established a minimum sod strength value of 37 pounds (17 kg) for harvestable Kentucky bluegrass sod.

The CSP is an effective tool for obtaining quantitative values of turfgrass sod strength. These results warrant further research to develop quantitative sod strength minimums for other turfgrass species. CSP measurements will also bene-

fit future research, particularly establishment investigations, where limits of acceptability are necessary.

Utilizing the CSP ensures that an acceptable sod is being harvested for commercial sales, adding a comfort level for both the producer and the purchaser of the sod.

— **John C. Sorochan** and **John N. Rogers, III** are members of the Department of Crop and Soil Sciences at Michigan State University, Lansing, MI. Sorochan can be reached at sorochan@msu.edu

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