

## Core Cultivation vs. Graden Cultivation

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The purpose of this study is to evaluate the difference in two cultivation methods on a putting green surface. Even though core cultivation will disrupt the putting surface, the benefits of this practice have obviously been well documented, both in terms of soil physical properties and turf quality. However, the Graden cultivation machine is a fairly new product with little to no documented research. Briefly, it operates similar to a verticutting machine, but is able to penetrate down into the soil profile as deep as 2.0". Furthermore, it has been calculated that the Graden will disrupt twice as much surface area versus core cultivation. Therefore will the Graden cultivation machine be twice as effective in improve soil and turf properties versus core cultivation?

## Materials and Methods

The experimental design was a 1 x 5 (cultivation x treatments) randomized complete block design with three replications. Each plot was measured to 1.67 m x 1.67 m. The plots were located at the Hancock Turfgrass Research Center on the Michigan State University campus. *Agrostis palustris* "Penncross" was established at the site. Two cultivation machines were used; the first, a Toro Greens Aerifier (Minneapolis, MN) using 3/8" (0.95 cm) tines and 2" x 2" (5.1 x 5.1 cm) spacing had a width of 27" (68 cm). Second, a Graden cultivation machine (Victoria, Australia) with vertical blades had a band width of 17" (43 cm) wide. There are 12 blades measured to 2 mm thick with 1" (2.5 cm) spacing in between each blade. The depth of the Toro aerifier was at 3" (7.6 cm), and the depth of the Graden was at 1" (2.5 cm) for the first two applications. The treatments consisted of a check, aerified with the Toro once (T1), aerified with the Toro twice (T2), aerified with the Graden once (G1), and aerified with the Graden twice (G2). Treatments were applied on 14 August, 2001 and 21 May 2002. Grass, plugs and soil debris were removed and then the treatments were topdressed and dragged in. Urea (46-0-0) was applied at a 0.5#N/M (24.5 N kg/ha) rate in August 2001 and 25-5-15 was applied at 0.5# N/M (24.5 N kg/ha) rate in May 2002. Mowing height was maintained just above 1/8" (135 mm) throughout the study. Fertility, topdressing and IPM has been applied on an as needed basis.

Before treatments were applied, infiltration rates were recorded on each plot on 3 and 4 August 2001. After treatments were applied, infiltration rates were recorded on 10 September 2001 and 11 June 2002. The double ring infiltrometer test was conducted using a constant head with the outside ring having a diameter of 8.9" (22.7 cm) and the inside ring having a diameter of 4.9" (12.5 cm). Organic matter content was evaluated on 30 July 2001, 19 September 2001 and 11 June 2002 at depths of 0 - 0.5", 0.5 - 1.0", 1-2", 2-4" and 4-8" (0 - 1.27 cm, 1.27 - 2.54 cm, 2.54 - 5.08 cm, 5.08 - 10.16 cm, 10.16 - 20.32 cm). The soil probe had a diameter of 0.75" (1.9 cm).

## Comments

Currently, our discussion is limited with our comparison, but some observations were made along the way. We have only cultivated twice at the time of this publication. However, we do anticipate seeing some significant results in the upcoming year with our organic matter and

infiltration data. Although the Graden can be labor intensive in cleaning up debris (due to debris being scattered versus "nice" clean plugs), you disrupt twice as much surface area with one pass versus a core cultivation pass. A smoother putting surface can result after use of the Graden as well. The Graden has uses for any sand-based root zones albeit greens, tees, sports fields, etc. If the golf course superintendent or sports field manager is in a curative basis, core cultivation and Graden cultivation should complement each other and also rotated in application every 7-10 days pending on growth and time of year. If on a preventative basis, the Graden would be an excellent tool for controlling organic matter content and improving water moving through the soil profile.

Moss HTRC - 2002	
Interval (Days)	Treatment and Rate/1000 sq ft
14	1 TD 2380 4 oz
14	2 TD 2380 8 oz
14*	3 TensCyte 8 lbs
7	4 Dawn Detergent 4 fl oz
14	5 Moss Master 1 lb (in 35 gal branch)
14	7 Kocide 1 lb (in 5 gal)
7	8 Sporek 3.75 fl oz
7	9 Ionized Copper - 100 ppm
28	10 Scott's Moss Control Granules 3.88 lbs
14	11 Gardensafe Moss + Algae Killer 80 fl oz (in 25 gal)
28	13 Schweizer M. Royal 140 g (in 2 gal)
7	14 Ionized Copper - 10 ppm
-	16 Control

\*Applied as needed on 14-day schedule