SOD ROOTING RESEARCH

D. K. Lee and P. E. Rieke
Department of Crop and Soil Sciences, MSU

Two studies were conducted during 1988 to evaluate the effects of soil cultivation technique on rooting of newly laid sod. The first was essentially a repeat of a sod rooting study established in 1987 to determine if the results obtained in the 1987 study could be repeated. The second study was designed to evaluate effects of cultivation technique on soil physical properties. In this study treatments were applied to the soil followed by sampling to measure effects on such parameters as bulk density, saturated hydraulic conductivity and pore size distribution. Financial support for these studies was provided by the Michigan Turfgrass Foundation and is gratefully acknowledged. The sod utilized for these studies was donated by Halmich Sod Nurseries for which we are also grateful.

Study 1

The technique used in this study involved placing a 1 foot x 1 foot sod piece in a rooting box and allowing it to grow on a treated plot for a specific length of time. The soil modified was a heavy sandy loam. The rooting box was then lifted, and the force of extraction recorded. Previous studies in 1987 had shown that there was a direct correlation between the lifting force and root development. Treatments were initiated 8/1/88 and the plots sodded 8/2/88. The treatments included were no cultivation (check), compacted, hollow tine coring, solid tine coring and rototilling. A Toro vertical operating aerifier was used for the coring cultivation with 1/2" solid and hollow tines. Compaction treatments were applied using a Ryan's vibrating roller and rototilling treatments were applied using a walk behind rototiller. The first set of rooting boxes were lifted 8/31/88, the second 9/30/88 and the third will be lifted June 89.

Table 1 displays the lifting forces for the first and second extraction dates. The results showed that cultivated plots have better root development as compared to the non-cultivated plots (check or compacted) on both extraction dates. However, on the second date the compacted treatment had lower lifting weights than the checks. This pattern occurred much sooner than in the 1987 study which happened only on the third date. Based on the two extractions and the 1987 results, cultivation enhanced and promoted better rooting while compacted soil adversely affected root development. It also showed that vertically operated cultivation techniques offer an effective alternative to rototilling.

Study 2

All plots were compacted with the Ryan's vibrating roller before the initiation of treatments on 7/14/88. The soil was the same as in Study 1. There were 4 treatments with 4 replications in this study. The treatments were no cultivation, compacted plot (check), hollow tine coring, solid tine coring and rototilling. The treatments were executed similarly to Study 1. The plots were then subjected to heavy irrigation to saturate the soil in order to speed up the resettling process. This procedure was repeated weekly for a total of three irrigations. The core samples were taken 8/2/88 using a

3" diameter, 3" depth sampling cylinder. The cores were taken to the laboratory for bulk density, saturated hydraulic conductivity and pore size distribution determination.

Table 2 gives the data for bulk density, saturated hydraulic conductivity and total pore space of the soil sampled 8/3/88 while Table 3 displays pore size distribution results.

The results showed that all three cultivation techniques were effective in reducing bulk density significantly, therefore, successful in alleviating soil compaction. Saturated hydraulic conductivity, which is related to percolation rate, showed a slight increase among the cultivated plots but was not statistically different from the check. All cultivation treatments increased total porosity significantly. The increase in total porosity was due to the increase in macropores (Table 3). Macropore spaces, also known as "air porosity", are usually filled with air and therefore provide aeration for the roots. Cultivation with hollow or solid tines increased macropores significantly. Rototilling also increased macropores but differences were not statistically significant compared to the check. .

This study will be concluded in June 1989 when another set of core samples will be collected and similar physical properties determined.

Although further data need to be collected we are confident that core cultivation with a vertically operating aerifier can serve as a practical alternative to rototilling as a means of soil preparation for turf establishment. Aerifying with solid tines resulted in somewhat faster rooting than hollow tines but over a longer period both proved effective. Rototilling is also effective in loosening the soil but could be harmful on the long term stability of soil structure. While the cost of such an aerifier is initially high, rototilling is more labor intensive and requires further soil leveling and settling compared to aerifying with an effective aerifier. It is essential that the aerifier have a high energy impact when entering the soil and that the tines reach a depth of 2.5-3 inches or more.

TABLE 1. CULTIVATION EFFECT ON FORCE REQUIRED TO LIFT ROOTING BOXES, Study 1 Treatments initiated 8/1/88

TREATMENTS	8/31/88	9/30/88
CHECK	27.4 b*	41.5 b
COMPACTED	26.5 b	33.9 c
HOLLOW TINE CORING	30.7 ab	48.3 a
SOLID TINE CORING	33.0 ab	51.0 a
ROTOTILLING	35.2 a	52.6 a

*Any two means with the same letter are not significantly different at p=.05 by Duncan's Multiple Range Test.

TABLE 2 CULTIVATION EFFECTS ON SOIL PARAMETERS. SOD ROOT STUDY 2. Initiated 7/14/88. Soil sampled 8/3/88.

TREATMENTS	BD †	SHC †	PORE †
	g/cc	cm/hr	%
CHECK	1.85 a *	.26 a	27.0 b
HOLLOW TINE CORING	1.74 b	.36 a	30.9 a
SOLID TINE CORING	1.75 b	.33 a	32.8 a
ROTOTILLING	1.76 b	.35 a	30.2 a

† BD - Bulk density
SHC - Saturated hydraulic conductivity
PORE - Total pore space

* Any two means with the same letter are not significantly different at p=.05 by Duncan's Multiple Range Test

TABLE 3. INFLUENCE OF CULTIVATION ON THE DISTRIBUTION OF MACRO-PORES AND MICROPORES, Study 2 treatments initiated 7/14/88. Soil samples collected 8/3/88

TREATMENTS	MICROPORES	MACROPORES	TOTAL POROSITY
	---------- % ----------		
CHECK	21.6 a *	4.1 b	26.8 b
HOLLOW TINE CORING	21.0 a	8.3 a	30.3 a
SOLID TINE CORING	21.5 a	8.8 a	31.3 a
ROTOTILLING	21.3 a	7.2 ab	29.4 a

* Any two means with the same letter are not significantly different at p=.05 by Duncan's Multiple Range Test.