**Evaluating the Influence of a Liquid Polymer(SuperSoil) On Soil Aggregation**

D.D. Minner Ph.D Iowa State University and S.K. Lee

**Introduction**

A soil aggregate is defined as many soil particles held in a single mass or cluster, such as a clod, crumb, block, or prism (Brady and Weil, 2002). Pore space created by binding these particles together improves retention and exchange of air and water. Stability of soil aggregate refers to the ability of soil aggregates to resist disruption when outside forces are applied. Products that increase soil aggregation would benefit turfgrass growth on compacted soils with poor soil aeration. This study was initiated to determine if a liquid organic polymer mixture has any influence on turfgrass quality or soil aggregation.

**Materials and Methods**

The study was conducted from December 22, 2003 to March 16, 2004 (76 day growing period) in the research greenhouse at the Iowa State University Horticulture Department, Ames, IA. SuperSoil was applied to two soils. Local Iowa topsoil (Nicollet, fine-loamy, mixed, mesic Aquic Hapludoll) with 4.0% organic matter was screened and dried. Commercial baseball infield clay, QuickDry®, was used as the second soil. Material for both soils was processed through a hammer mill and soil that passed a 149 micron sieve was used in the green house study. Soil was placed in 2.5 by 2.5 inch plastic pots and treated with SuperSoil liquid organic polymer solution. The Iowa-Soil required 100g of soil treated with 89 ml of SuperSoil® and QuickDry® required 70g of porous clay material treated with 76.5 ml of SuperSoil solution to fill each pot (Fig 1). Two conditions, with grass and without grass, were made to measure stability of soil aggregate. An additional set of treatment pots with grass were used for destructive sampling during root weight measurement. Pots were seeded with 'Catalina' Perennial ryegrass (Lolium perenne L.) at 7 lbs/1000 sqft on December 22, 2003. Fertilizer was applied 30 days after planting to supply 1.0 lb of N, P, and K/1000 sqft. One inch of water per week was applied to promote growth during the study. On 16 Mar 2004 at the end of the study period, aggregate stability was measure according to a modified method by Cambardella and Elliott (1993).

The experimental design was a randomized complete block with three replications and 12 treatments (Table 1). There were 3 rates of SuperSoil liquid organic polymer (0, 2, and 4%), 2 soil sources (Iowa-soil and QuickDry® soil) and 2 grass conditions conditions (with and without grass) for a total of 12 treatments. The data were analyzed using PROC ANOVA of the SAS software, Version 8 of the SAS System for Windows (SAS Institute, 1999). Means were separated ($\alpha = 0.05$) by Fischer's protected LSD Results

The greenhouse study was initiated as a preliminary study to determine if there was any beneficial response from SuperSoil treatment. Results of the preliminary findings were to serve as the basis for further study.

The aggregate particle size distribution and the aggregate mean weight diameter (MWD) are presented in Table 2. Mean weight diameter of soil aggregates is an indication of the stable fraction of the aggregates in the soil system. A higher mean weight diameter value indicates more stable aggregates. Treatment effects were significant for mean weight diameter. The Iowa-soil with grass had more stable aggregates when treated with 2% and 4% SuperSoil (MWD 1.09 and 0.93, respectively) compared with the untreated control (MWD 0.62). Increasing SuperSoil rate from 2% to 4% did not influence aggregate MWD. Without grass SuperSoil had no influence on aggregate MWD.

**Table 1. Treatments showing 3 levels of SuperSoil, 2 soil types, and 2 levels of grass cover.**

| Treatment# | Treatment list |
|---|---|
| 1. | Iowa soil and 0% SuperSoil with grass |
| 2. | Iowa soil and 2% SuperSoil with grass |
| 3. | Iowa soil and 4% SuperSoil with grass |
| 4. | QuickDry® and 0% SuperSoil with grass |
| 5. | QuickDry® and 2% SuperSoil with grass |
| 6. | QuickDry® and 4% SuperSoil with grass |
| 7. | Iowa soil and 0% SuperSoil without grass |
| 8. | Iowa soil and 2% SuperSoil without grass |
| 9. | Iowa soil and 4% SuperSoil without grass |
| 10. | QuickDry® and 0% SuperSoil without grass |
| 11. | QuickDry® and 2% SuperSoil without grass |
| 12. | QuickDry® and 4% SuperSoil without grass |

**Table 2. Summary ANOVA, aggregate size distribution, and aggregate mean weight diameter for SuperSoil (SS) treatments evaluated in a green house study conducted 22 Dec 2003 to 16 Mar 2004.**

| Aggregate Particle Size Distribution | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2mm | 250um | 90um | 53um | | Macro aggregate | MWD† |
| **Source** | | | | | | | |
| **Treatment Block** | ** | NS | NS | ** | ** | ** | ** |
| | * | NS | NS | * | * | * | * |
| **Treatment** | %------------------------------------------------------------------------------ | | | | | | **mm.** |
| 1. Iowa soil, 0% 55 + grass | 24.2 | 5.9 | 42.4 | 10.0 | 14.9 | 30.1 | 0.62 |
| 2. Iowa soil, 2% 55 + grass | 48.0 | 8.7 | 27.0 | 5.6 | 8.5 | 56.8 | 1.09 |
| 3. Iowa soil, 4% 55 + grass | 38.1 | 12.0 | 29.9 | 7.3 | 10.9 | 45.3 | 0.95 |
| 4. QUickDry®, 0% 55 + grass | 2.4 | 9.1 | 39.3 | 19.5 | 27.2 | 11.6 | 0.17 |
| 5. QUickDry®, 2% 55 + grass | 1.6 | 6.7 | 39.7 | 17.8 | 31.5 | 8.4 | 0.14 |
| 6. QUickDry®, 4% 55 + grass | 1.3 | 9.7 | 42.5 | 24.4 | 21.3 | 11.1 | 0.16 |
| 7. Iowa soil, 0% 55 | 34.8 | 14.3 | 32.0 | 6.1 | 10.6 | 49.2 | 0.89 |
| 8. Iowa soil, 2% 55 | 35.9 | 9.3 | 35.3 | 7.7 | 10.0 | 45.2 | 0.87 |
| 9. Iowa soil, 4% 55 | 47.1 | 9.8 | 24.9 | 6.5 | 9.2 | 57.0 | 1.08 |
| 10. QUickDry®, 0% 55 | 1.8 | 4.4 | 45.1 | 16.0 | 29.6 | 6.2 | 0.13 |
| 11. QUickDry®, 2% 55 | 6.7 | 10.6 | 38.9 | 17.6 | 24.2 | 17.4 | 0.24 |
| 12. QUickDry®, 4% 55 | 9.0 | 10.8 | 34.4 | 18.6 | 23.2 | 19.9 | 0.27 |
| LSD 0.05 | 19.3 | NS | NS | 6.5 | 9.7 | 17.9 | 0.32 |

* Significant at 0.05 probability level.
** Significant at 0.01 probability level.
† Mean weight diameter.

**References**


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