USDA AGRICULTURAL RESEARCH SERVICE
NATIONAL SOIL TILTH LABORATORY
2150 PAMMEL DRIVE
AMES IA 50010

Turf2Max: Analysis of aggregate size and stability.

Methods for aggregate stability

To determine the actual soil aggregate stability and size a wet sieving protocol was conducted in each of the soil treatment samples. Before the wet sieving protocol can commence all soil samples should be initially air dried. Also prepare the following materials and paraphernalia: a) four 1 gallon capacity plastic pans containers; b) one 1 liter graduated cylinder; c) 2 wash bottles; d) USA Standard Testing Sieve at 2mm, 250um, 90um, and 53um (one of each); e) 180 pieces small size aluminum pan containers (5 inches length x 3 inches width x 2.5 inches depth); f) 36 pieces large size aluminum pan (13 inches length x 10 inches width x 3 inches depth); and g) one digital Mettler balance.

After all the soil samples are air dried, each soil sample should be broken down into uniform size soil aggregate sizes. As much as you can all organic materials (e.g. roots, moss, algae, etc.) should be carefully removed so as not to damage the soil sample. Special care should be exercised when handling the with grass treatments. Place uniformly broken up soil sample into small size aluminum pan, but prior to placing the soil sample, weigh and record the weight of the aluminum pan first. Then weigh again (pan + soil) to get the initial weight of the sample.

After all the soil treatments and materials have been prepared the wet sieving protocol can start (Note: all soil samples should undergo this procedure). Place the 2mm sieve inside the 1 gallon plastic pan container; pour in 2 liters of tap water in the 1 gallon plastic container using the 1 liter graduated cylinder. Place soil sample inside the 2mm sieve and start wet sieving. Move the 2mm sieve in an up and down motion 60 times (Note make sure that the bottom end of the sieve will not touch the bottom of the 1 gallon plastic container while sieving). After sieving place the collected 2mm soil aggregates inside the small size aluminum container using a wash bottle (Note: make sure that you weigh first the small size aluminum container before placing the sieved soil aggregate). Make sure that all the sieved soil aggregates are transferred inside the aluminum pan without spilling. Transfer the sieved soil solution collected in the 1 gallon plastic container into the 250um sieved placed inside another 1 gallon plastic container. Repeat wet sieving process done in 2mm sieve but without pouring another two liters of tap water. Repeat this process using the 90um, 53um sieve to complete the wet sieving process for one soil treatment sample. Transfer the last soil solution that passed through the 53um sieve (<53um soil aggregates) in a large size aluminum pan container.

The aluminum containers containing all the wet sieved soil aggregates are then placed inside a special air drying oven chamber for 24 hour or until the water has dried out of the aluminum container. Once the sieved soil samples are air dried remove the aluminum containers from the oven and start reweighing all aluminum containers in order to get the dry weight of each of the sieved aggregate sizes (e.g. 2mm, 250um,. 90um, 53um, and <53um) using the digital Mettler balance.

After all the data were collected the percent total soil mass per each of the aggregate sizes were calculated. Statistical analysis was also conducted on the gathered data. Analysis of variance was performed on the data. LSD procedure was estimated for mean separations.

Table 1. List of treatments

Treatment #	Treatment list
1	Iowa soil and 0% Turf2Max with grass
2	Iowa soil and 2% Turf2Max with grass
3	Iowa soil and 4% Turf2Max with grass
4	Porous clay and 0% Turf2Max with grass
5	Porous clay and 2% Turf2Max with grass
6	Porous clay and 4% Turf2Max with grass
7	Iowa soil and 0% Turf2Max without grass
8	Iowa soil and 2% Turf2Max without grass
9	Iowa soil and 4% Turf2Max without grass
10	Porous clay and 0% Turf2Max without grass
11	Porous clay and 2% Turf2Max without grass
12	Porous clay and 4% Turf2Max without grass

Results

Table 2. Analysis of variance, treatment means and LSD values for analysis of 12 individual treatments.

		Particle size distribution						
		2mm	**250um**	**90um**	**53um**	**L53um**	**Macroagr**	**MWD***
Source								
	Treatment	0.0001	0.4341	0.3949	0.0001	0.0001	0.0001	0.0001
	Block	0.0064	0.2700	0.7533	0.0180	0.0037	0.0050	0.0063
Treatment		%						mm
1	Iowa soil, 0% T2M + grass	24.20	5.95	42.49	10.04	14.95	30.14	0.62
2	Iowa soil, 2% T2M + grass	48.03	8.79	27.00	5.65	8.50	56.82	1.09
3	Iowa soil, 4% T2M + grass	38.14	12.08	29.93	7.34	10.93	45.35	0.93
4	Porous clay, 0% T2M + grass	2.44	9.18	39.38	19.53	27.27	11.62	0.17
5	Porous clay, 2% T2M + grass	1.63	6.77	39.71	17.87	31.53	8.40	0.14
6	Porous clay, 4% T2M + grass	1.34	9.76	42.59	24.42	21.33	11.10	0.16
7	Iowa soil, 0% T2M	34.88	14.39	32.07	6.19	10.63	49.27	0.89
8	Iowa soil, 2% T2M	35.96	9.30	35.38	7.70	10.04	45.26	0.87
9	Iowa soil, 4% T2M	47.16	9.84	24.98	6.54	9.25	57.00	1.08
10	Porous clay, 0% T2M	1.82	4.45	45.16	16.07	29.65	6.27	0.13
11	Porous clay, 2% T2M	6.76	10.65	38.92	17.68	24.23	17.41	0.24
12	Porous clay, 4% T2M	9.07	10.83	34.49	18.63	23.24	19.90	0.27
	$LSD_{0.05}$	19.363	7.678	17.958	6.579	9.765	17.902	0.32

*Mean weight diameter.

Table 3. Analysis of variance, treatment means and LSD values for analysis of a factorial arrangement of Turf2Max rate, media and grass on 12 treatments.

	Particle size distribution						
	2mm	**250um**	**90um**	**53um**	**L53um**	**Macro-agr.**	**MWD***
Source							
Rate (0,2,4% T2M)	0.1890	0.5389	0.3041	0.4342	0.2033	0.1434	0.1383
Media (PCC, Iowa Soil)	0.0001	0.3885	0.0329	0.0001	0.0001	0.0001	0.0001
Grass (With, without)	0.3975	0.4903	0.6405	0.1252	0.5314	0.1842	0.3553
Block	0.0063	0.3289	0.7561	0.1410	0.0040	0.0096	0.0083
	%						mm
Rate							
0% T2M	15.84	8.49	39.77	12.96	20.62	24.33	0.45
2% T2M	23.09	8.88	35.25	12.23	18.58	31.97	0.58
4% T2M	23.93	10.63	33.00	14.23	16.19	33.33	0.61
$LSD_{0.05}$	9.72	4.17	9.00	3.19	4.96	9.76	0.17
Media							
Iowa soil	38.06	10.06	31.98	7.24	10.72	47.31	0.91
Porous clay	3.84	8.61	40.04	19.03	26.21	12.45	0.19
$LSD_{0.05}$	7.93	3.41	7.35	2.60	4.05	7.97	0.14
Grass							
With	19.30	8.75	36.85	14.14	19.09	27.24	0.52
Without	22.61	9.91	35.17	12.14	17.84	32.52	0.58
$LSD_{0.05}$	7.9323	3.4074	7.3487	2.6005	4.0532	7.9698	0.14

*Mean weight diameter.