COMPOST AS AN AMENDMENT FOR SAND ROOTZONES FOR TURFGRASS. I. GREENHOUSE TRIAL.

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Sponsor: AllTreat Farms
Natural Sciences and Engineering Research Council of Canada

Objectives

The objective of this research was to evaluate five different composts for their value as an amendment to sand rootzones for turfgrass growth.

Materials and Methods

Five composts were provided by the sponsor, AllTreat Farms. The composts are produced from proprietary recipes, but all are Type AA composts (organic matter content >50%, minimal heavy metals, no pathogens, no inert contaminants). The analysis of the composts at maturity is presented in Table 1. The composts were mixed 20:80 by volume with sand to produce typical sand rootzone mixtures. The sand was chosen to meet USGA specifications for particle size distribution and other features. Mixtures were analysed for their compliance to USGA specifications (Table 2.)

Table 1. Analysis of mature composts.

		Compost number				
Component		**1**	**2**	**3**	**4**	**5**
Organic matter %	Analysis 1	55.90	50.50	53.40	52.60	53.00
	Analysis 2	56.00	48.00	49.30	52.60	58.00
Organic carbon %		27.60	25.20	26.70	26.30	26.50
Nitrogen %		1.83	1.71	1.29	1.63	1.55
Phosphorus %		2.00	1.29	0.99	1.22	1.64
Potassium %		0.96	0.81	0.66	0.94	0.87
Magnesium %		1.32	1.82	1.56	1.72	1.51
Calcium %		11.21	10.73	9.37	9.61	10.44
Arsenic		1.00	1.10	0.90	0.50	1.00
Cadmium		1.40	1.65	1.30	1.84	1.95
Chromium		42.97	61.79	37.49	53.04	51.65
Cobalt		1.10	1.20	2.85	2.19	0.75
Copper		42.74	32.93	24.80	35.64	32.77
Lead		5.00	5.00	5.60	6.40	5.50
Mercury		0.03	0.02	0.02	0.03	0.02
Molybdenum		3.29	3.80	3.99	4.03	3.34
Nickel		56.83	94.11	80.33	101.39	88.37
Selenium		0.81	0.77	0.72	0.93	0.85
Zinc		304.17	275.45	227.18	269.31	264.15
Sodium %		0.27	0.33	0.17	0.22	0.20
Manganese		763.42	730.54	648.81	711.88	779.54
Carbon / nitrogen ratio		15.08	14.74	20.70	16.13	17.10

Table 2. Physical characteristics of 80:20 sand:compost rootzone mixtures.

		Compost number				
Characteristic		**1**	**2**	**3**	**4**	**5**
Gravel % by mass		1.41	2.08	1.33	1.22	1.23
V. coarse sand % by mass		6.01	6.78	6.63	6.40	6.59
Gravel&VC sand	USGA rec <10	7.42	8.86	7.96	7.62	7.82
Coarse sand % by mass		47.56	45.42	44.45	47.39	45.56
Medium sand % by mass		39.30	39.42	40.95	39.02	39.44
C&M sand	USGA rec >60	86.86	84.84	85.40	86.41	85.00
Fine sand	USGA rec <20	4.03	4.31	4.75	4.47	4.65
V. fine sand	USGA rec <5	0.85	0.89	0.87	0.88	0.83
Silt & Clay	USGA rec <8	0.86	1.06	1.06	0.76	0.85
VF sand&Silt&Clay	USGA rec <10	1.71	1.95	1.93	1.64	1.68
Organic matter %		1.4	0.4	1	1	1
Total porosity %	USGA rec 35-55	43	44	44	43	43
Air-filled porosity % (at 40cm tension)	USGA rec 20-30	32	32	32	31	31
Capillary porosity % (at 40cm tension)	USGA rec 15-25	11	11	12	12	12
Saturated Conductivity cm/hr		120.03	114.71	117.83	128.00	101.39
Dry bulk density g/cm3		1.46	1.46	1.47	1.43	1.41
Volumetric water content						
	-saturated	0.43	0.44	0.44	0.43	0.43
	-30 cm	0.12	0.12	0.12	0.13	0.12
	-40 cm	0.11	0.11	0.12	0.12	0.12
	-120 cm	0.09	0.10	0.10	0.10	0.10
	-333 cm	0.09	0.10	0.09	0.10	0.09
	-1000 cm	0.08	0.09	0.08	0.08	0.08

Four inch plastic pots were filled with each mixture, up to the rim of the pot (approx. 3/4 litre), and the pots were watered thoroughly and seeded with Emerald creeping bentgrass (*Agrostis palustris*) at a typical rate for turf (0.5 kg 100 m^{-2}). Pots were seeded March 2, 1998. Ten replicates were prepared of each compost mixture, and the replicates were placed in the greenhouse (Hort. Department, University of Guelph) in a randomized complete block design. Pots were irrigated with plain water to prevent drying out until the grass had germinated and emerged, and then irrigated to prevent drought stress. 100 ml of standard fertilizer solution (1% 20-20-20) was added to each pot on March 28, and 80 ml of solution to each pot on April 6 and April 24.

Data collection. Pots were assessed daily for one week from first emergence of seedlings (March 10, 8 DAS) and then 20, 23, and 25 DAS. On 8, 9, 10 and 11 DAS, the number of emerged seedlings was counted or estimated and the germination/establishment was also rated on a scale of 1-10, where 10 = complete cover of turf. After 11 DAS seedlings were too numerous to count, so only the germination/establishment ratings were collected.

On March 31 (29 DAS) the grass in each pot was clipped at 15 mm above the rootzone surface, and the clippings collected for drying and weighing. Subsequent growth was harvested on April 6, 15, and 22 (36, 45, and 52 DAS).

Color measurements for the pots were taken with a Minolta CR310 colormeter on May 11, 1998.

Results

The germination/emergence data for the compost mixtures are presented in Table 3. Dry weights of clippings are presented in Table 4. Color measurements are presented in Table 5.

Table 3. Germination and establishment of creeping bentgrass in compost/sand rootzones. March 10 is 8 days after seeding.

Compost	03/10		03/11		03/12		03/13		03/14	03/15	03/16	03/22	03/25	03/27
	C[a]	R[b]	C	R	C	R	C	R						
1	22.5 a	0.5 a	40.0 a	0.9 a	80.6 a	1.9 a	134.3 a	3.2 a	3.5 a	3.9 a	4.0 a	6.5 a	7.1 a	7.9 a
2	0.9 b	0.0 b	4.4 b	0.1 b	18.7 b	0.4 b	56.5 b	1.6 b	2.1 b	2.7 b	2.7 b	5.2 b	5.7 b	6.7 b
3	1.1 b	0.0 b	5.7 b	0.1 b	21.0 b	0.5 b	58.8 b	1.8 b	2.2 b	2.5 b	2.6 b	5.0 bc	4.9 b	5.5 c
4	0.0 b	0.0 b	0.1 b	0.0 b	4.8 b	0.1 b	45.3 b	1.5 b	2.0 b	2.1 b	2.6 b	4.3 c	5.0 b	5.9 bc
5	4.5 b	0.1 b	9.0 b	0.2 b	21.1 b	0.5 b	49.8 b	1.7 b	2.0 b	2.4 b	2.6 b	4.5 bc	5.0 b	5.8 bc
lsd(5%)	9.1	0.2	16.0	0.4	26.1	0.6	28.9	0.6	0.6	0.7	0.7	0.9	1.0	1.0

[a] Counts of emerged seedlings per pot (after 03/13 seedlings were too numerous to count).
[b] Ratings of emergence/cover 0-10, 10 = 100% cover.
Means of 10 replicate pots. Means within columns followed by the same letter are not significantly different (p=0.05, Fisher's protected lsd test).

Table 4. Dry weight[a] (g) of clippings collected from bentgrass grown in compost amended sand rootzones.

	Date (DAS)				
Compost	03/31 (29)	04/06(36)	04/15 (45)	04/22 (52)	Total
1	0.18	0.21 a	0.22	0.15	0.70
2	0.14	0.18 ab	0.24	0.16	0.66
3	0.15	0.16 b	0.20	0.14	0.76
4	0.13	0.16 b	0.22	0.18	0.72
5	0.17	0.17 b	0.22	0.15	0.69
lsd (5%)	NS	0.03	NS	NS	NS

[a] Plants were clipped at 15 mm above the rootzone surface and the clippings oven-dried (75EC) to constant weight. Means of 10 replicates. Means within columns followed by the same letter are not significantly different (p=0.05, Fisher's protected lsd test).

Table 5. Instrumental color readings from bentgrass grown in compost/sand mixtures.

Compost	L[a]	C[b]	H[c]
1	22.4	46.0	123.7
2	21.3	45.3	123.3
3	21.5	45.8	122.3
4	21.7	45.7	123.6
5	22.3	45.9	123.6

[a] L = lightness (0-100, 0=black, 100= white)
[b] C = chroma or saturation of color (0-60, 0=grey, 60=fully saturated color)
[c] H = hue angle (0-360, in the range observed a lower value is yellower and a higher value is greener)

Conclusions

All five composts produce rootzone mixtures that were within the USGA specifications when mixed 20:80 with the sand used with the possible exception of air-filled porosity and capillary porosity. The former was a little high and tha latter a bit low. The natural processes of aging in the rootzone mix are likely to push the balance toward the correct mix of large and small pores. The organic matter content was also a bit lower than what is sometimes recommended (though this is not part of the USGA specs).

Of the five composts tested, number 1 had significantly higher rates of germination and establishment, as well as more growth (dry weight) on the one observation date when there were significant differences. Number 2 was the best of the other four, though generally the differences were not significant. There were no differences among treatments for color.

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Materials and Methods

Two composts were chosen from five composts studied in greenhouse trials (reported elsewhere in this issue). Composts were provided by the sponsor, AllTreat Farms. The composts are produced from proprietary recipes, but all are Type AA composts (organic matter content >50%, minimal heavy metals, no pathogens, no inert contaminants). The analysis of the two composts at maturity is presented in Table 1.

Table 1. Analysis of mature composts.

		Compost number	
Component (ppm unless indicated)		**1**	**2**
Organic matter %	Analysis 1	55.90	50.50
	Analysis 2	56.00	48.00
Organic carbon %		27.60	25.20
Nitrogen %		1.83	1.71
Phosphorus %		2.00	1.29
Potassium %		0.96	0.81
Magnesium %		1.32	1.82
Calcium %		11.21	10.73
Arsenic		1.00	1.10
Cadmium		1.40	1.65
Chromium		42.97	61.79
Cobalt		1.10	1.20
Copper		42.74	32.93
Lead		5.00	5.00
Mercury		0.03	0.02
Molybdenum		3.29	3.80
Nickel		56.83	94.11
Selenium		0.81	0.77
Zinc		304.17	275.45
Sodium %		0.27	0.33
Manganese		763.42	730.54
Carbon / nitrogen ratio		15.08	14.74

The composts were mixed 20:80 by volume with sand to produce typical sand rootzone

mixtures. The sand was chosen to meet USGA specifications for particle size distribution and other features. Mixtures were analysed for their compliance to USGA specifications (Table 2.) The third mixture was a standard USGA 80:20 sand:peat mixture provided by TCG Materials.

Table 2. Physical characteristics of 80:20 sand:compost rootzone mixtures.

		Compost number	
Characteristic		**1**	**2**
Gravel % by mass		1.41	2.08
V. coarse sand % by mass		6.01	6.78
Gravel&VC sand	USGA rec <10	7.42	8.86
Coarse sand % by mass		47.56	45.42
Medium sand % by mass		39.30	39.42
C&M sand	USGA rec >60	86.86	84.84
Fine sand	USGA rec <20	4.03	4.31
V. fine sand	USGA rec <5	0.85	0.89
Silt & Clay	USGA rec <8	0.86	1.06
VF sand&Silt&Clay	USGA rec <10	1.71	1.95
Organic matter %		1.4	0.4
Total porosity %	USGA rec 35-55	43	44
Air-filled porosity % (at 40cm tension)	USGA rec 20-30	32	32
Capillary porosity % (at 40cm tension)	USGA rec 15-25	11	11
Saturated Conductivity cm/hr		120.03	114.71
Dry bulk density g/cm3		1.46	1.46
Volumetric water content			
	-saturated	0.43	0.44
	-30 cm	0.12	0.12
	-40 cm	0.11	0.11
	-120 cm	0.09	0.10
	-333 cm	0.09	0.10
	-1000 cm	0.08	0.09

A rootzone facility was constructed, with 12 sections, each 2 m x 3 m in dimension (Figure 1). Tile drains (100 mm plastic) were set in the subgrade, which was graded to provide a 1% slope as indicated in Figure 1. Plywood dividers isolated the sections, and each was filled with a standard USGA construction rootzone (100 mm of 1 cm pea gravel layer, no choker layer, 300 mm of 80:20 rootzone mix). Gravel and mix were dumped in the sections with a skid-steer loader, but because of the dividers all spreading and levelling was done by hand. The three rootzone mixtures were replicated four times in a randomized complete block design. Construction was begun on June 9, 1998 and completed July 15, 1998.

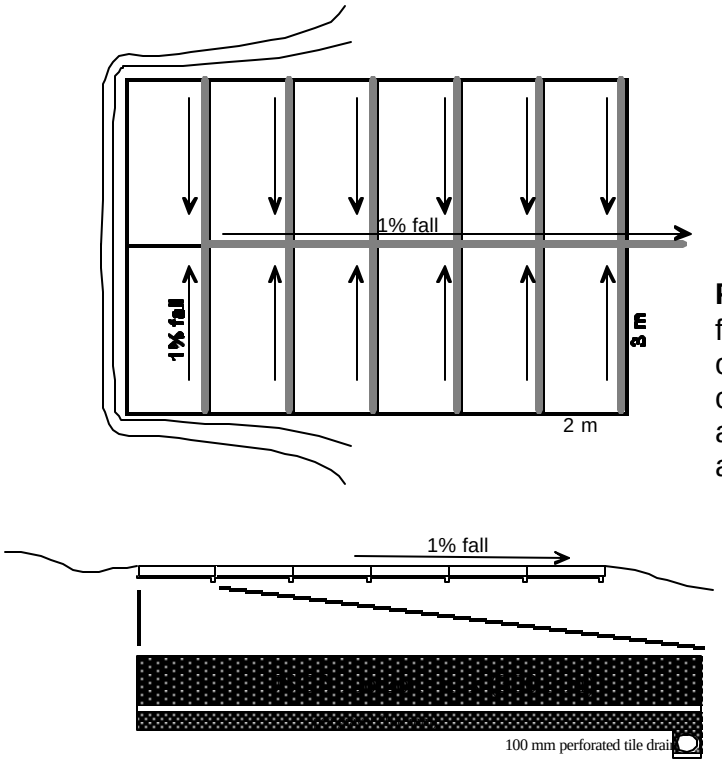

Figure 1. Layout of rootzone facility for assessment of compost as an organic amendment. 12 units comprised of 4 replicates of 2 compost amended mixtures and 1 peat amended mixture.

Plots were seeded with Cobra creeping bentgrass (*Agrostis palustris*) on July 20, 1998. The seeding rate was 0.5 kg seed 100 m^{-2}, seeded with a drop spreader in two passes. The plots were irrigated to maintain a moist seedbed. No starter fertilizer was used, as we wished to assess the native fertility of the mixtures. Once the grass had germinated and established to the point that the rootzones were stabilized (20 days after seeding [DAS]), the plywood dividers were pulled with a 2 ton chain hoist on a frame. Mowing was begun 40 DAS, at 25 mm with a rotary mower. Mowing height was reduced to 15 mm using a walk-behind greensmower 70 DAS. A fertilizer treatment (Andersons 14-28-10: 0.75 kg 100 m^{-2} actual N, 1.5 kg 100 m^{-2} P_2O_5) was applied on Aug. 28 (39 DAS) because the peat-amended rootzone was lagging behind the two compost rootzones in germination and we judged that low fertility was the reason.

Data Collection

Germination and establishment was recorded daily (except weekends) from first emergence (July 25, 5 DAS) until Oct. 13 (53 DAS). Germination/establishment was assessed visually on a scale of 0-10, with 10 being complete cover.

Volumetric water content was measured in the top 50 mm of rootzone with a Theta-probe® frequency-domain reflectometer on August 26 and again on November 23.

Core samples (2 cm x 25 cm, 5 samples per plot) were collected on Oct. 6. Rootzone mix was washed from the root systems and the depth of root system was measured. Root systems were also ranked on a scale from 1-10, integrating length and mass to estimate relative size of the root systems.

Clippings were harvested on Oct. 22, 6 days after the most recent mowing. Samples were oven-dried (75EC) to constant weight, weighed, and then analysed for various elements.

Results

Germination and establishment. The pattern of germination and establishment of the bentgrass on the different rootzone mixtures is presented in Figure 2. By 8 DAS the two compost rootzones were significantly ahead of the peat rootzone. At 17 DAS the three mixtures were all significantly different, with compost #2 > compost #1 > peat. This pattern remained until about 40 DAS, when the two compost rootzone mixtures were again not significantly different, and both had completely grown in. The peat mixture did not reach 100% cover during the grow-in period.

Volumetric water content. The volumetric water content as measured in the rootzones is presented in Figure 3. Both compost-amended mixtures had significantly higher volumetric

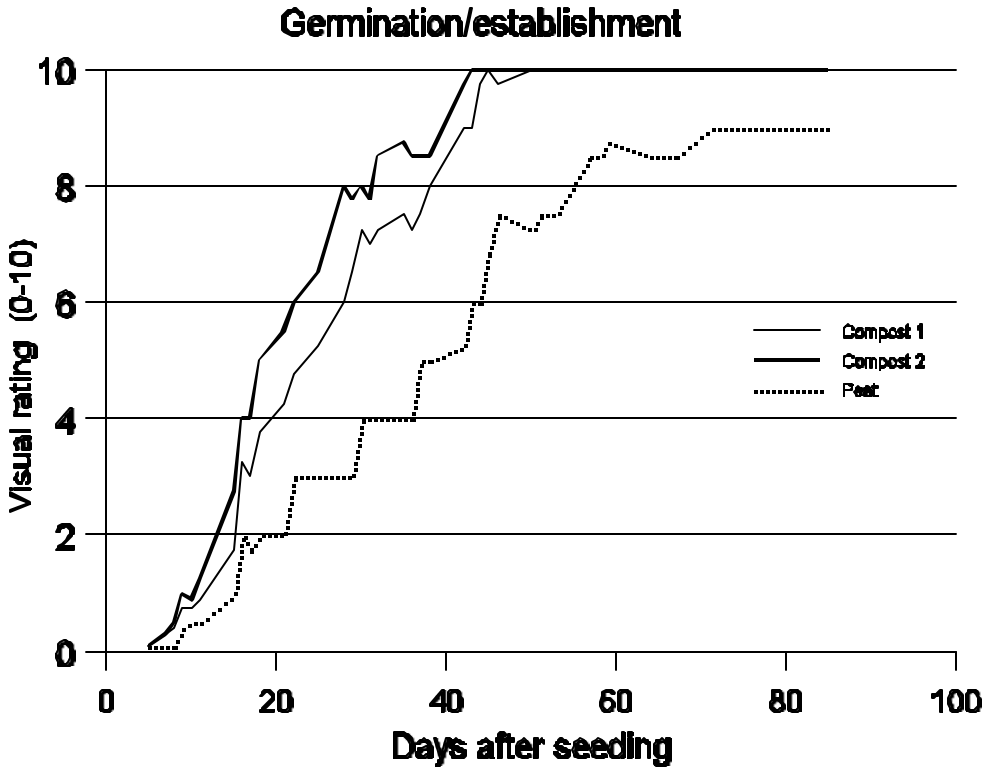

Figure 2. Germination/establishment ratings of Cobra creeping bentgrass on 80:20 USGA rootzones. Lines represent mean ratings of 4 replicates per observation date.

water content in the top 50 mm than the peat-amended mixture. August 26 measurements were taken during a prolonged period of high water stress conditions (though all plots were irrigated to prevent drought stress to the turf); November 23 measurements were taken after the autumn rains had begun.

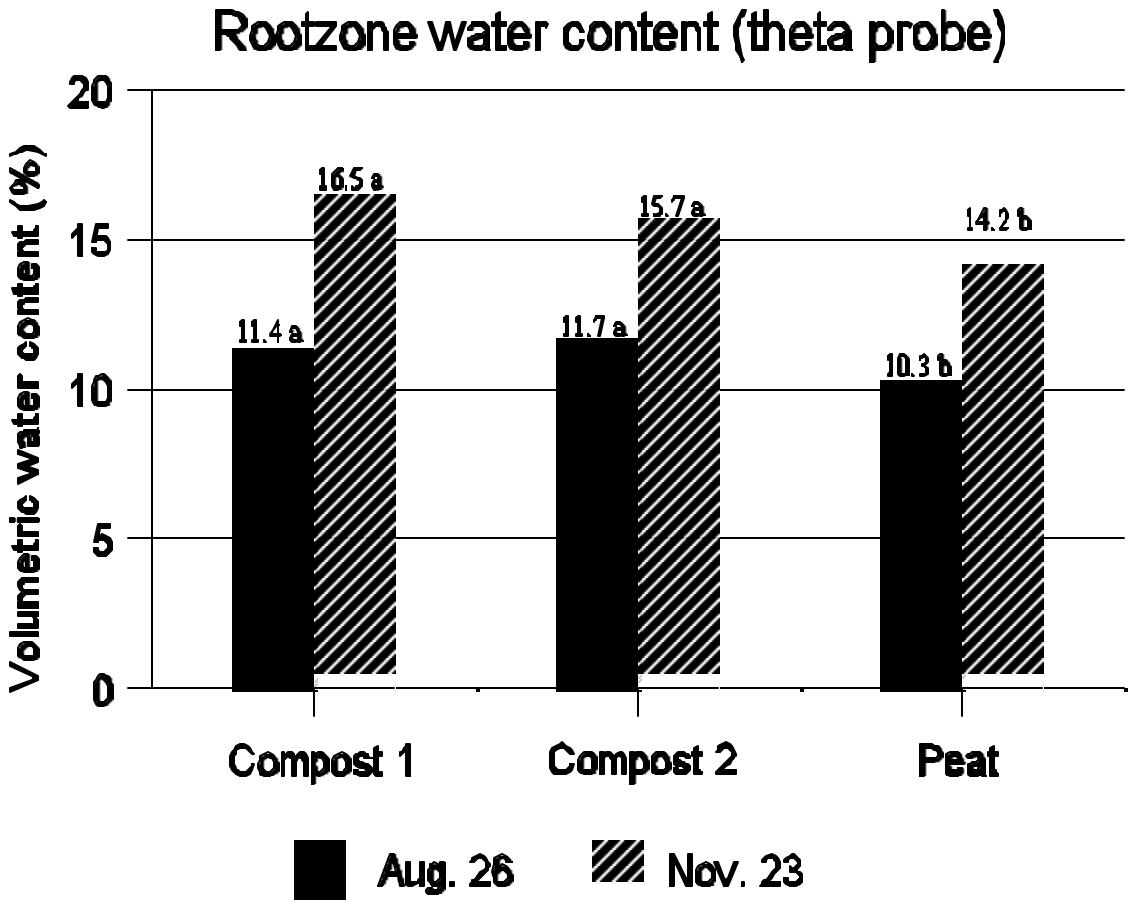

Figure 3. Volumetric water content measured with frequency-domain reflectometer. Means of 10 measurements x 4 replicates. Means within dates followed by the same letter are not significantly different (p=0.05, Fisher's protected lsd test).

Root system. The root system depth was significantly larger in compost-amended rootzones than in peat-amended plots (Figure 4). Ranking of root system size separated the two compost treatments as well, with root systems in compost #1 being significantly larger than those in compost #2.

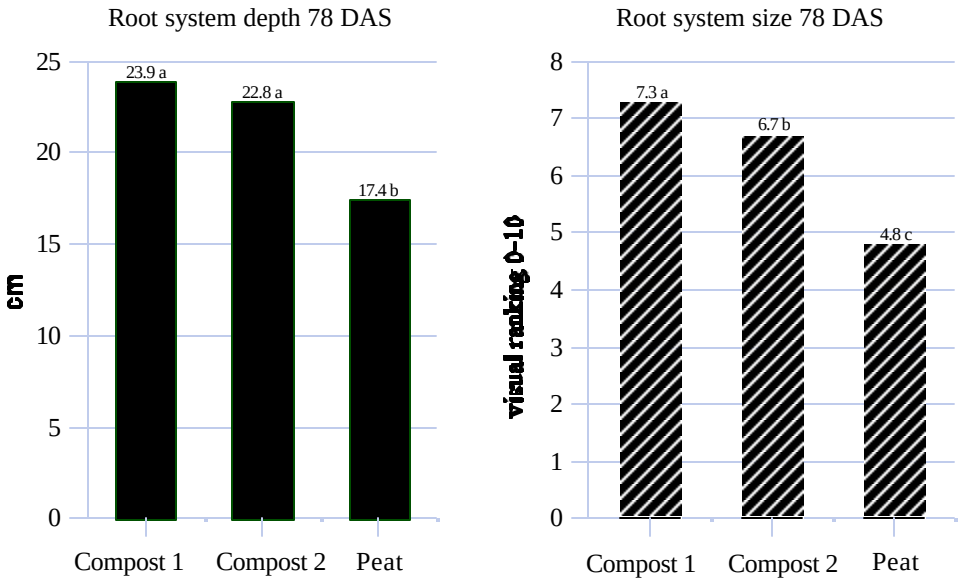

Figure 4. Root system measurements for bentgrass grown on different rootzones. Means of 5 cores x 4 replicates. Means followed by the same letter are not significantly different (p=0.05, Fisher's protected lsd test).

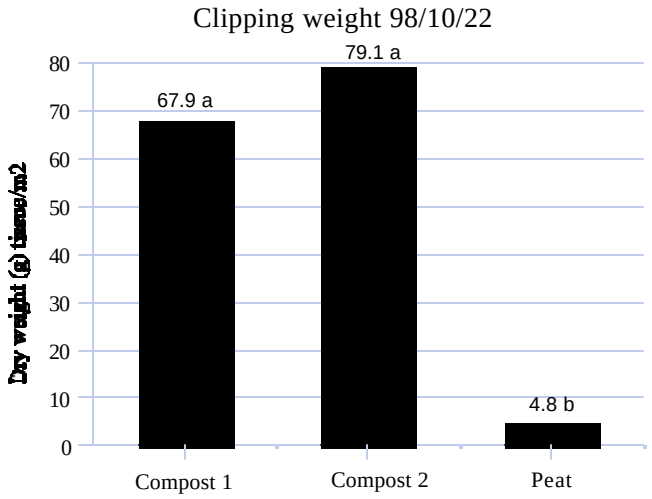

Figure 5. Clipping weights of bentgrass harvested from different rootzones. Tissue represents 6 days growth of turf mowed at 15 mm.

Tissue samples. There were large and significant differences in the growth rate of bentgrass on the amended rootzones as measured in clipping yields (Figure 5). Both compost

amended rootzones produced at least 10-fold more growth than the peat.

The tissue contents of samples collected showed significant differences between the compost and peat amended rootzones (Table 3). N, P, and K were significantly higher in the leaf tissue from compost rootzones, while certain micronutrients, particularly Zn, B, and Ca, were much higher in the leaf tissue from the peat amended plots.

Table 3. Leaf tissue contents[a] of clippings from bentgrass grown on various rootzones.

Rootzone	N	P	K	Ca	Mg	Mn	Cu	Zn	B
			— % —				— mg/kg —		
Compost 1	3.21 a	0.42 a	2.85 a	1.20 b	0.37 b	11.50	38.00 ab	87.75 b	11.25 b
Compost 2	3.32 a	0.50 a	2.97 a	0.84 b	0.34 b	11.50	41.50 a	83.00 b	11.00 b
Peat	2.02 b	0.18 b	1.24 b	6.51 a	1.40 a	9.00	33.75 b	212.50 a	17.25 a
lsd (p=0.05)	0.60	0.09	0.63	2.95	0.53	NS	5.43	53.39	4.04

[a] Means of four replicates. Means followed by the same letter are not significantly different (p=0.05, Fisher's protected lsd test.

Conclusions

Both compost amended rootzones significantly out-performed a standard 80:20 sand:peat USGA rootzone mixture. Germination was about 20 days faster in the compost rootzones, growth rate of both shoot and root systems significantly faster, and water-holding capacity of the rootzone significantly larger. Some of this can be attributed to the native fertility component of the compost, which is higher than peat. The N, P and K content of the compost is < 2%, and adding starter fertilizer to the peat amended plots did not allow the turf to catch up with that growing on the compost mixtures. Long term performance of the rootzones over the next few years, including examination of aspects of the rootzone such as soil microbiology, will, we hope, determine how much of the improved performance of the compost mixtures can be attributed variously to physical, chemical, and biological features of the amendment.

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The composts were mixed 20:80 by volume with sand to produce typical sand rootzone mixtures. The sand was chosen to meet USGA specifications for particle size distribution and other features. Mixtures were analysed for their compliance to USGA specifications (Table 2.) The third mixture was a standard USGA 80:20 sand:peat mixture provided by TCG Materials.

A rootzone facility was constructed, with 12 sections, each 2 m x 3 m in dimension (Figure 1). Tile drains (100 mm plastic) were set in the subgrade, which was graded to provide a 1% slope as indicated in Figure 1. Plywood dividers isolated the sections, and each was filled with a standard USGA construction rootzone (100 mm of 1 cm pea gravel layer, no choker layer, 300 mm of 80:20 rootzone mix). Gravel and mix were dumped in the sections with a skid-steer loader, but because of the dividers all spreading and levelling was done by hand. The three rootzone mixtures were replicated four times in a randomized complete block design. Construction was begun on June 9, 1998 and completed July 15, 1998.

Plots were seeded with Cobra creeping bentgrass (*Agrostis palustris*) on July 20, 1998. The seeding rate was 0.5 kg seed 100 m^{-2}, seeded with a drop spreader in two passes. The plots were irrigated to maintain a moist seedbed. No starter fertilizer was used, as we wished to assess the native fertility of the mixtures. Once the grass had germinated and established to the point that the rootzones were stabilized (20 days after seeding [DAS]), the plywood dividers were pulled with a 2 ton chain hoist on a frame. Mowing was begun 40 DAS, at 25 mm with a rotary mower. Mowing height was reduced to 15 mm using a walk-behind greensmower 70 DAS. A fertilizer treatment (Andersons 14-

28-10: 0.75 kg 100 m^{-2} actual N, 1.5 kg 100 m^{-2} P_2O_5) was applied on Aug. 28 (39 DAS) because the peat-amended rootzone was lagging behind the two compost rootzones in germination and we judged that low fertility was the reason.

Data Collection

Volumetric water content was measured in the top 50 mm of rootzone with a Theta-probe® frequency-domain reflectometer on March 30, April 30, and July 29, 1999.

Core samples (2 cm x 25 cm, 4 samples per plot) were collected on April 19, 1999. Rootzone mix was washed from the root systems and the depth of root system was measured. Root systems were also ranked on a scale from 1-10, integrating length and mass to estimate relative size of the root systems.

Infiltration rates were taken with a double-ring infiltrometer (2/plot) on June 8 and September 20, 1999. Weekly visual readings of color and percent cover of turf were taken during the experiment.

Results

Soil water. Under both high and low soil water conditions, the two compost amended rootzones had higher volumetric water content than the peat (Table 1). Infiltration rates were also significantly higher for Compost 2 on both observation dates, and for Compost 1 on June 6 (Table 2).

Root systems. The two compost amended rootzones had significantly deeper and larger root systems than the peat amended rootzones (Table 3). Based on ranked size, Compost 1 had significantly larger root systems than Compost 2. The difference in P levels noted below may contribute to this difference.

Rootzone analysis. There were significant differences between the compost amended rootzones and the peat in elemental analysis, with the former having higher levels of P, K, and Mg, and lower pH (Table 4). Cation exchange capacity and organic carbon followed the same trend, but the differences were not significant.

Visual color, quality, uniformity, and density ratings. The same pattern was seen in all the visual ratings of performance, with the compost amended plots consistently darker green, higher quality, more uniform and denser over the season (Table 5, 6, 7, 8). The differences were greatest early in the season and diminished towards the end.

Instrumental color. Lightness (L) and hue angle (H) which are the most meaningful instrumental color measurements, followed a similar pattern to the visual color (Table 9, 10, 11). Where differences were significant, the compost plots were generally darker and greener.

Dollar spot control. There was trend for less dollarspot in the compost amended rootzones, but the differences were not significant (Table 12).

Weed infestation. The compost amended rootzones had significantly fewer broadleaf weeds (by count and by percent area) than the peat amended rootzones (Table 12). This is probably in part a residual effect of the slower germination and establishment of the bentgrass on the peat plots.

Conclusions

Both compost amended rootzones significantly out-performed a standard 80:20 sand:peat USGA rootzone mixture. Color, quality, uniformity and density were all better in the compost rootzones. Turf had significantly larger and deeper root systems growing in the compost amended rootzones. Infiltration rate and volumetric water content of the compost amended rootzones were significantly higher than the standard peat. Broadleaf weed infestation was significantly lower in the compost amended plots, and dollar spot infections was also lower, though not significantly so. Elemental analysis of the rootzone mixes indicated much higher levels of P and K, lower pH, and a higher CEC and total C content in the compost amended rootzones.

Table 1: Volumetric water content measured with Theta Probe frequency domain reflectometer.

Rootzone	03/30	07/29
Compost 2	20.89 a	12.42 a
Compost 1	20.42 ab	12.41 a
Peat	19.45 b	11.36 b
lsd p=0.05	1.02	0.96

Table 2: Rootzone measurements (cores collected 04/19).

Rootzone	Depth (cm)	Rank size (1-10)
Compost 1	10.0 a	8.3 a
Compost 2	9.6 a	6.2 b
Peat	7.0 b	2.3 c
lsd p=0.05	1.45	0.83

Table 3: Infiltration rate (cm hr^{-1}) measured with double ring infiltrometer.

Rootzone	06/08	09/20
Compost 2	249.24 a	238.46 a
Compost 1	227.35 a	206.26 b
Peat	176.38 b	181.38 b
lsd p=0.05	32.1	26.0

Table 4: Rootzone analysis - samples collected 04/29.

Rootzone	P	K	Mg	pH	C.E.C.	Total C	Inorganic C	Organic C
	mg/kg				cmol+/kg	%		
Compost1	55.0 a	25.5 ab	134.0 a	7.9 a	6.1	5.3	4.6	0.8
Compost2	44.3 b	31.3 a	143.0 a	7.9 a	5.1	5.3	4.7	0.6
Peat	3.3 c	15.0 b	119.3 b	8.1 b	4.3	4.9	4.6	0.3

Table 5: Visual color rating in rootzone trials.

	Mean rating 0 - 10 (10 = darkest green)						
Rootzone	**0429**	**0507**	**0514**	**0521**	**0528**	**0604**	**0610**
Compost 1	7.5	7.0	7.0	7.8	7.8	7.0	7.3
Compost 2	7.3	7.0	7.0	7.5	7.0	7.0	7.3
Peat	4.0	5.8	5.0	6.8	6.0	6.0	5.3
lsd p=0.05	1.0	0.5	0.0	NS	0.5	0.0	0.8
	0618	**0625**	**0702**	**0709**	**0715**	**0723**	**0729**
Compost 1	7.8	7.0	7.3	7.0	7.0	7.0	8.0
Compost 2	7.5	7.0	7.0	7.0	7.0	7.0	8.0
Peat	6.5	5.8	6.3	7.0	6.3	6.3	7.0
lsd p=0.05	0.9	0.5	0.7	NS	0.5	0.5	0.0
	0805	**0812**	**0818**	**0827**	**0902**	**0910**	**0917**
Compost 1	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Compost 2	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Peat	7.3	7.5	8.0	7.8	7.3	7.3	7.3
lsd p=0.05	0.5	NS	NS	NS	0.5	0.5	0.5
	0924	**0930**	**1007**	**1014**	**1022**	**1029**	**Mean**
Compost 1	8.0	8.0	8.0	8.0	8.0	7.8	7.6
Compost 2	8.0	7.8	8.0	8.0	8.0	7.8	7.6
Peat	7.5	6.8	7.5	6.8	7.0	6.5	6.6
lsd p=0.05	NS	1.0	NS	0.9	0.8	1.1	0.2

Table 6: Visual quality rating in rootzone trials.

	Mean rating 0 - 10 (10 = best)						
Rootzone	**0429**	**0507**	**0514**	**0521**	**0528**	**0604**	**0610**
Compost 1	6.8	7.0	6.8	6.8	7.5	7.5	7.1
Compost 2	6.3	7.0	6.3	7.0	7.0	7.3	6.8
Peat	2.3	4.3	3.3	4.3	4.3	5.0	4.5
lsd p=0.05	1.1	0.5	0.8	0.7	0.7	0.7	1.1
	0618	**0625**	**0702**	**0709**	**0715**	**0723**	**0729**
Compost 1	7.3	6.3	7.0	7.0	6.3	7.0	7.0
Compost 2	7.5	6.8	7.0	7.0	6.5	7.0	7.3
Peat	5.5	5.0	6.0	5.3	5.3	5.0	6.0
lsd p=0.05	0.9	0.7	0.0	0.5	0.8	0.0	0.5
	0805	**0812**	**0818**	**0827**	**0902**	**0910**	**0917**
Compost 1	6.8	7.0	8.0	7.0	7.0	7.0	8.0
Compost 2	6.8	7.3	8.0	7.0	7.0	7.5	7.8
Peat	6.3	6.5	7.3	6.8	6.3	6.3	6.5
lsd p=0.05	NS	NS	0.5	NS	0.5	NS	1.0
	0924	**0930**	**1007**	**1014**	**1022**	**1029**	**Mean**
Compost 1	7.5	7.5	8.0	7.5	7.5	7.0	7.1
Compost 2	8.0	7.3	8.0	7.5	7.3	7.0	7.1
Peat	6.8	6.3	6.8	6.8	6.5	6.3	5.6
lsd p=0.05	NS	0.8	0.9	NS	NS	0.5	0.2

Table 7: Visual uniformity rating in rootzone trials.

	Mean rating 0 - 10 (10 = best)						
Rootzone	**0429**	**0507**	**0514**	**0521**	**0528**	**0604**	**0610**
Compost 1	7.3	6.5	6.8	6.8	7.5	7.5	7.0
Compost 2	7.0	6.5	6.3	7.0	7.0	7.5	6.5
Peat	3.5	4.3	4.3	4.3	5.0	5.0	5.3
lsd p=0.05	0.7	0.9	0.8	0.7	0.5	0.8	0.7
	0618	**0625**	**0702**	**0709**	**0715**	**0723**	**0729**
Compost 1	7.3	6.0	6.8	6.0	6.5	6.0	7.3
Compost 2	7.5	6.0	6.5	6.0	6.8	6.0	7.5
Peat	6.5	5.0	6.0	5.8	6.0	5.0	6.0
lsd p=0.05	NS	0.0	NS	NS	NS	0.0	0.7
	0805	**0812**	**0818**	**0827**	**0902**	**0910**	**0917**
Compost 1	6.3	7.8	8.0	7.3	7.0	7.5	8.0
Compost 2	6.3	7.8	8.0	7.3	7.0	7.8	7.8
Peat	6.0	7.0	7.3	6.8	6.3	6.0	7.0
lsd p=0.05	NS	NS	0.5	NS	0.5	0.7	NS
	0924	**0930**	**1007**	**1014**	**1022**	**1029**	**Mean**
Compost 1	7.8	7.5	7.8	7.5	8.0	7.3	7.1
Compost 2	8.0	7.3	8.0	7.5	7.8	7.0	7.1
Peat	7.5	6.3	6.5	6.8	7.0	6.5	5.9
lsd p=0.05	NS	0.8	1.0	NS	NS	NS	0.2

Table 8: Visual density rating in rootzone trials.

	Mean rating 0 - 10 (10 = best)						
Rootzone	**0429**	**0507**	**0514**	**0521**	**0528**	**0604**	**0610**
Compost 1	7.5	8.0	7.3	7.8	8.0	7.0	8.0
Compost 2	7.3	8.0	7.0	7.5	7.5	7.3	7.5
Peat	3.8	4.8	4.3	4.8	5.3	5.0	5.3
lsd p=0.05	1.1	0.5	0.7	0.8	0.7	0.5	0.7
	0618	**0625**	**0702**	**0709**	**0715**	**0723**	**0729**
Compost 1	7.0	7.0	7.0	7.0	7.0	7.3	7.8
Compost 2	7.0	7.0	7.0	7.0	7.3	7.3	8.0
Peat	6.5	6.0	6.0	6.0	6.3	6.0	6.0
lsd p=0.05	NS	0.0	0.0	0.0	0.7	0.7	0.5
	0805	**0812**	**0818**	**0827**	**0902**	**0910**	**0917**
Compost 1	6.8	8.0	8.0	8.0	7.0	8.0	8.0
Compost 2	6.5	8.0	8.0	8.0	7.0	8.0	8.0
Peat	6.0	7.3	7.3	7.3	6.3	6.3	7.3
lsd p=0.05	NS	0.5	0.5	0.5	0.5	0.5	0.5
	0924	**0930**	**1007**	**1014**	**1022**	**1029**	**Mean**
Compost 1	7.8	8.0	8.0	8.0	8.0	8.0	7.6
Compost 2	8.0	8.0	8.0	8.0	8.0	8.0	7.6
Peat	7.5	7.3	7.3	7.3	7.3	7.3	6.2
lsd p=0.05	NS	0.5	0.5	0.5	0.5	0.5	0.2

Table 9: Turf lightness (L) measured with CR310 colormeter

	Mean L (0 - 100, 0 = black, 100 = white)								
Rootzone	**0517**	**0528**	**0604**	**0622**	**0630**	**0708**	**0715**	**0728**	**0806**
Compost 1	33.2	32.8	33.5	35.9	34.8	33.4	37.0	34.5	30.0
Compost 2	33.2	33.0	32.7	34.2	33.3	35.7	35.5	34.5	30.0
Peat	31.0	32.6	32.4	34.2	34.3	36.4	38.2	34.4	29.8
lsd p=0.05	1.1	NS	NS	1.0	1.2	1.5	2.1	NS	NS
	0903	**0910**	**0917**	**0924**	**1001**	**1008**	**1015**	**1101**	**Mean**
Compost 1	35.4	36.8	31.9	38.9	36.8	41.3	37.6	40.3	35.5
Compost 2	35.3	37.9	31.7	38.0	37.4	41.8	37.4	40.7	35.4
Peat	35.7	38.2	32.5	39.5	38.7	42.5	37.3	41.1	35.8
lsd p=0.05	NS	NS	NS	0.9	1.0	0.6	NS	0.6	NS

Table 10: Turf color saturation (C, chroma) measured with CR310 colormeter.

	Mean L (0 - 60, 0 = grey, 60 = vivid)								
Rootzone	**0517**	**0528**	**0604**	**0622**	**0630**	**0708**	**0715**	**0728**	**0806**
Compost 1	13.2	14.2	11.9	13.3	11.4	11.4	11.5	9.8	10.8
Compost 2	12.6	14.1	11.8	13.8	11.5	11.9	10.9	9.5	11.7
Peat	15.2	15.1	12.8	13.6	11.7	13.0	11.3	10.1	12.4
lsd p=0.05	1.1	NS	NS	NS	NS	0.8	NS	NS	NS
	0903	**0910**	**0917**	**0924**	**1001**	**1008**	**1015**	**1101**	**Mean**
Compost 1	12.0	11.1	13.9	13.2	16.7	14.3	14.5	19.1	13.1
Compost 2	11.5	11.9	14.2	12.2	15.7	13.9	14.3	18.1	12.9
Peat	10.9	11.7	13.8	13.1	16.3	13.2	14.0	17.2	13.2
lsd p=0.05	NS	NS	NS	NS	0.7	0.7	NS	0.6	NS

Table 11: Turf hue angle (H) measured with CR310 colormeter.

	Mean H (0 - 360, in the observed range a higher hue angle is greener, a lower angle is yellower)								
Rootzone	**0517**	**0528**	**0604**	**0622**	**0630**	**0708**	**0715**	**0728**	**0806**
Compost 1	135.2	132.3	126.5	122.9	125.1	128.0	124.0	126.7	141.7
Compost 2	134.8	132.6	128.8	126.3	130.8	121.2	128.9	125.8	141.4
Peat	141.8	134.7	131.2	127.8	129.2	122.6	117.6	126.8	143.3
lsd p=0.05	2.7	NS	3.0	3.1	4.0	4.9	5.4	NS	NS
	0903	**0910**	**0917**	**0924**	**1001**	**1008**	**1015**	**1101**	**Mean**
Compost 1	111.8	120.8	131.8	120.1	133.4	125.2	129.9	124.6	127.0
Compost 2	109.1	119.7	132.7	118.9	131.9	124.3	130.0	123.2	127.1
Peat	108.1	119.8	130.4	116.4	129.7	121.7	128.8	120.2	126.5
lsd p=0.05	2.4	NS	NS	1.7	1.2	1.4	NS	1.7	NS

Table 12: Weed infestation and dollarspot infection rated 09/17.

Rootzone	Broadleaf weed count	Weed cover %	Dollar spot lesions m^{-2}
Compost 1	9.5 b	0.4 b	14.6
Compost 2	4.3 b	0.2 b	16.0
Peat	30.8 a	2.4 a	19.6