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Comparison of Salvia Growth in Seaweed Compost and Biosolids Compost

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Salvia 'Red Hot Sally' (*Salvia splendens* F. Sellow ex Roem. & Schult.) shoot dry mass and number of flower spikes was significantly greater in substrates containing compost made from biosolids and yard trimmings (SYT) than in substrates containing compost made from seaweed and yard trimmings (SW). Initial substrate electrical conductivity (EC), nitrogen (N), phosphorus (P), and potassium (K) concentrations also were greater in substrates containing SYT than in substrates containing SW. Salvia shoot dry mass and flower number increased as the percentage of SYT compost increased from 0 to 60% but decreased at 100% SYT. Initial EC levels in 100%SYT were more than twice as high as the levels measured in the other percentages. Shoot dry mass and number of flowers of plants grown in 30, 60, and 100% SW, however, was similar to plants grown in 0% SW. There were no differences in plant quality rating among the treatments and all salvia plants grown in both compost products were considered saleable.

Introduction

Compost made from biosolids and yard trimmings has been successfully used to grow dianthus, geranium, impatiens, marigold, petunia, snapdragon, and zinnia plants (Chaney et al. 1980; Sanderson 1980; Wootton et *al.* 1981; Klock 1997a; Klock 1997b), but the use of compost made from seaweed and yard trimmings is less commonplace. Some research has been conducted on the best methods to compost seaweed (Maze *et af.* 1993; Vallini et al. 1993; Eyras et *al.* 1998), but to date no studies have been published on the use of seaweed compost as a component of bedding plant substrates. The objective of this experiment was to compare 'Red Hot Sally' salvia (*Salvia splendens* F. Sellow ex Roem. & Schult.) growth in substrates containing compost made from seaweed and yard trimmings or compost made from biosolids and yard trimmings.

Materials and Methods

Plugs of 'Red Hot Sally' salvia were transplanted into 400-ml (9.2 cm tall x 10.2 cm diameter) round pots filled with four different percentages of the two compost products The pots were filled by volume with 1) 100 % compost; 2) 60% compost: 25% vermiculite: 15% perlite; *3)* 30% compost: 30% sphagnum peat: 2550 vermiculite: 15% perlite; or 4) 0% compost: 60% sphagnum peat: 25% vermiculite: 15% perlite. The seaweed (SW) compost was a 1:1 by volume mixture of seaweed and yard trimmings obtained from Terranova Industries (Miami, Florida). Seaweed (with garbage removed) collected from the beach area of an island was composted in windrows for three months. Yard trimmings collected locally were composted in windrows for eight to nine weeks. The two partially composted feedstocks were combined and composted in windrows for two to three weeks before screening through a 13 mm mesh. The biosolids compost (SYT) was a 1:1 by mass of biosolids and yard trimmings obtained from the Solid Waste Authority (SWA) of Palm Beach County Florida. Biosolids used by SWA were polvmer dewatered wastewater residuals (14% dry solids) obtained from two local facilities. The yard trimmings used were woody landscape waste ground and screened to 12-30 mm particle size. The SYT compost was made using a rectangular agitated bed system. Materials were mixed and composted for 21 days, cured for 3 months, and screened to pass a 19 mm screen.

All pots were top-dressed at transplanting with 5 g of 13N-5.7P-10.8K Nutricote **(type 100)** plus minors. Plants were watered twice daily at 0800 and 1300 HR. Thirty-eight days after transplanting, plant quality was rated on a scale of **1** to 5 with 5 = excellent, **4** = above average, 3 = average, 2 = below average, and 1 = dead. Plant quality ratings of $\geq$ 3 were considered saleable. The number of flower spikes per plant were recorded and shoots were cut at the surface of the growing substrate to determine shoot dry mass.

Initial air-filled porosity (AP), water-holding capacity (WHC), moisture content (MC), bulk density (BD), pH, electrical conductivity (EC), nitrogen (N), phosphorus **(P),** and potassium (K) were determined on three replicate samples. **AP,** WHC, MC, and BD were determined in 9.5 cm tall and 10.2 cm diameter round pots using volume displacement methods (Niedziela and Nelson 1992). Initial chemical parameters were **determined** by A&L Southern Agricultural Laboratories Inc. (Pompano Beach, **Florida)** using a Morgan extract (Soil and Plant Analysis Council, Inc. Athens, Georgia).

This experiment was conducted during March and April 1999 at the University of Florida Fort Lauderdale Research and Education Center in an open-sided greenhouse exposed to typical ambient air temperatures of 30/21C day/night. Pots were arranged in a completely randomized design with five single pot replications. All data were analyzed by analysis of variance and regression procedures (SAS Institute, Cary, North Carolina).

Results and Discussion

Salvia shoot dry mass and number of flower spikes, on average, were 1.3x and 1.2x, respectively, greater in substrates containing SYT compost than in substrates containing SW compost (Figure 1). Although initial WHC of substrates containing SW were higher than in substrates containing SYT (Table 1), higher initial EC, N, P, and K concentrations in substrates containing SYT (Table 2) probably contributed to greater growth. One reported benefit of using seaweed compost was increased WHC in sandy loam soils while a limiting characteristic of seaweed compost was its low N content (Eyras *et al.* 1998). However, composts made from biosolids tend to have relatively high N levels (Rynk et *al.* 1992).

Shoot dry mass and flower number of salvia plants grown in substrates containing SYT increased as the percentage of compost in the substrate increased from 0 to 60% but decreased at 100% SYT (Figure **1).** However, salvia shoot dry mass and flower number for plants grown in SW were not significantly different among the different percentages of SW in the substrate (Figure 1). Initial pH, EC, N, P, and K concentrations increased linearly as percentage of SYT in the substrate increased but only pH, EC, P, and K increased as the percentage of SW in the substrate increased (Table 2). Furthermore, there were no significant differences in initial N concentrations among 30, 60, or 100% SW (Table 2).

Generally, as the percentage of municipal solid waste compost in the substrate increases above 50%, growth of some plant species can he depressed due to high soluble salt concentrations, poor aeration, and/or heavy metal toxicities (Shiralipour *et al.* 1992). Klock (1997a) speculated that high initial soluble salt concentrations in substrates containing 100% compost made from biosolids probably suppressed growth

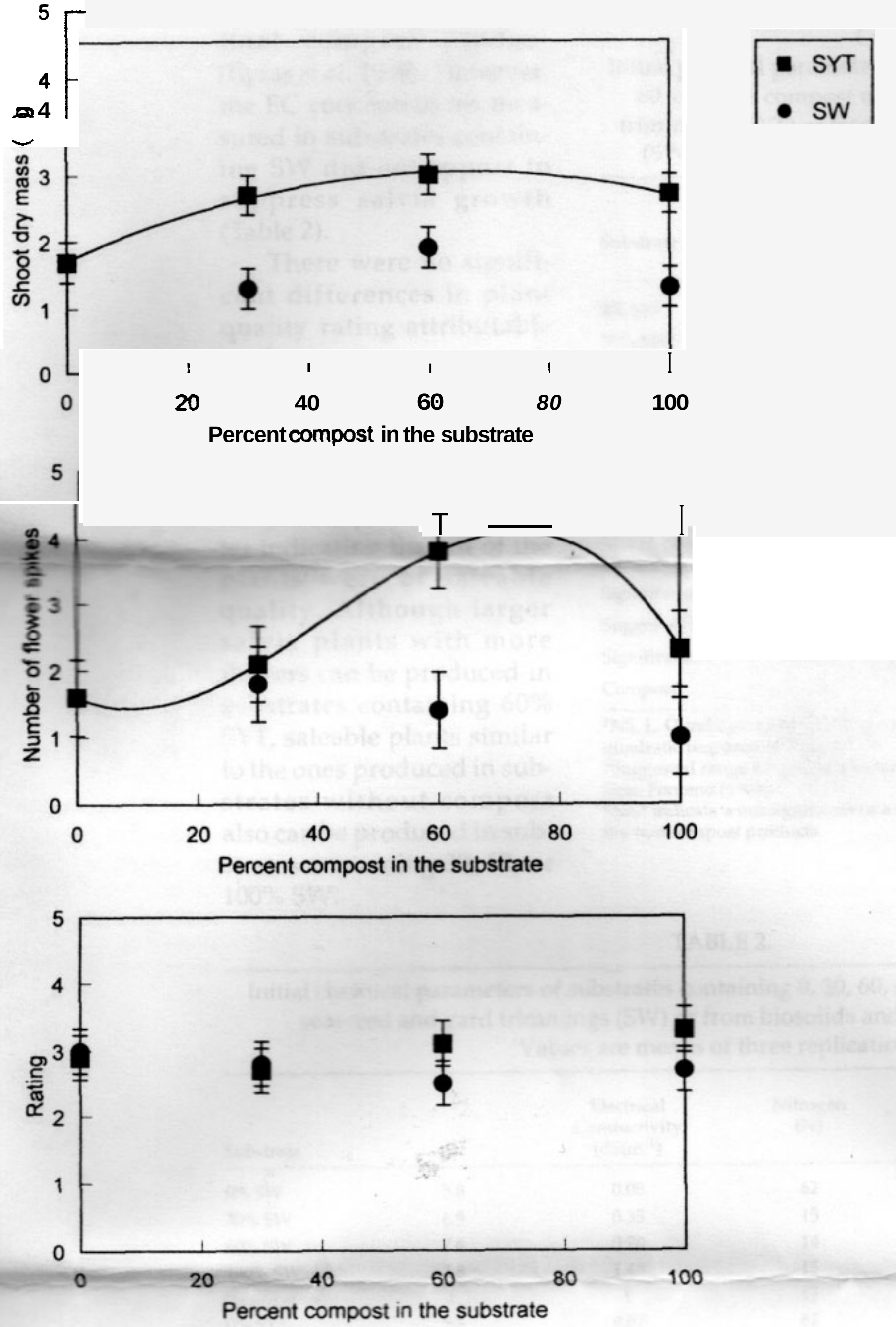

Figure 1. Final shoot dry mass, number of flower spikes, and plant rating of 'Red Hot Sally' salvia plants grown in substrates containing 0, 30, 60, or 100% compost made from seaweed and yard trimmings (SW) or from biosolids and yard trimmings (SYT). Equations of the line for final shoot dry mass are 1) SW: not significantly different; and 2) SYT: $y = -0.0003x^2 + 0.04x + 1.72$, $r^2 = 0.99$. Equations of the line for final number of flower spikes are 1) SW: not significantly different; and 2) SYT: $y = -0.00002x^3 + 0.003x^2 + -0.04x + 1.60$, $r^2 = 1.0$. Equations of the line for final plant rating are 1) SW: not significantly different; and 2) SYT: not significantly different. Values are means of five replications.

in petunia and dianthus plants. Initial EC concentrations were 13x greater in 100% SYT than 0% and were on average 3x greater in 100% SYT than in 30 and 60% SYT (Table 2). A potential problem to using seaweed compost can be high salinity of the final compost product (Eyras et *al.* 1998). However, the EC concentrations measured in substrates containing SW did not appear to suppress salvia growth (Table 2).

There were no significant differences in plant quality rating attributable to the two compost products or the different percentages of each compost product (Figure 1). All of the plants in this study were ranked a 3 (average) or better indicating that all of the pianis—were of saleable quality. Although larger salvia plants with more flowers can be produced in substrates containing 60% SYT, saleable plants similar to the ones produced in substrates without compost also can be produced in substrates containing 30, 60, or 100% SW.

TABLE 1.
Initial physical parameters of substrates containing 0, 30, 60, or 100% compost made from biosolids and yard trimmings (SYT) or from seaweed and yard trimmings (SW). Values are means of three replicate samples.

Substrate	Air-filled Porosity (%)	Water-holding Capacity (%)	Moisture content (%)	Bulk Density ($g(cm^{-3})$)
0% SW	40	56	81	0 13
30% SW	38	50	66	0 26
60% SW	14	55	53	0.50
100% SW	17	52	41	0 74
Significance[z]	L,Q	NS	L	L
0% SYT	39	52	75	0 14
30% SYT	24	36	63	028
60% SYT	22	32	60	0.49
100% SYT	21	21	39	0.68
Significance	Q	L	L	L
Suggested Range[y]	5 to 30	20 to 60	10 to 80	0 30 to 0 75
Significance[x]				
Compost	NS		NS	NS

[z]NS, L, Q indicate a nonsignificant response or a significant linear and/or quadratic response at $P \leq 0$ 05
[y]Suggested range for physical parameters based on recommendations from Fonteno (1996).
[x]NS,* indicate a nonsignificant or a significant difference ($P \leq 0.05$) between the two compost products

TABLE 2.

Initial chemical parameters of substrates containing 0, 30, 60, or 100% compost made from seaweed and yard trimmings (SW) or from biosolids and yard trimmings (SYT). Values are means of three replications.

Substrate	pH	Electrical Conductivity ($dS(m^{-1})$)	Nitrogen (N)	Phosphorus (P) ($ug \cdot g^{-1}$)	Potassium (K)
0% SW	5 8	0.08	62	15	50
30% SW	6.9	0.35	15	15	126
60% SW	7.6	0.78	14	18	209
100% SW	7.8	1 48	15	39	578
Signficance[z]	L	L	Q	L,Q	L
0% SYT	5.8	0.07	62	16	51
30% S M	6.1	0.59	151	73	345
60% SYT	7.1	0.97	121	80	650
100% SYT	6.9	2.17	200	80	700
Significance	L,Q	L	L,Q	L,Q	L
Suggested Range?	5.5 to 6.5	0.2 to 1.0	25 to 150	12 to 60	50 to 250
Significance[x]					
Compost	NS		*	*	*

[z]L, Q indicate a significant linear and/or quadratic response at $P \leq 0.05$.
Suggested range based on recommendations from A&L Southern Agricultural Laboratories who used a Morgan extract.
[x]NS,* indicate a non-significant or a significant difference ($P \leq 0.05$) between the two compost products.

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References

Chaney, R.L., J.B. Munns and H.M. Cathey. 1980. Effectiveness of digested sewage sludge compost in supplying nutrients for soilless potting media. *J. Amer. Soc.* Hort. *Sci.,* 105485-492.

Eyras, M.C., C.M. Rostagno and G.E. Defosse. 1998. Biological evaluation of seaweed composting. *Compost Sci. and Utilization,* 6(4)74-81.

Fonteno, W.C. 1996. Growing media: types and physical/chemical properties. *In:* D.W. Reed (ed.) *Water, Media and Nutrition of Greenhouse Crops.* Ball Publishing, Batavia, IL, vp. 93-122.

Klock, K.A. 1997a. Growth of dianthus and petunia in media amended with composted urban waste. *J. Environ. Hort.,* 15(3):135-137.

Klock, K.A. 1997b. Growth of salt sensitive bedding plants in media amended with composted urban waste. *Compost Sci. and Utilization,* 5(3):55-59.

Maze, J., P. Morand and P. Potoky. 1993. Stabilisation of "Green tides" *Ulva* by a method of composting with a view to pollution limitation. *J. Appl. Phycol.,* 5:183-190.

Niedziela, C.E., Jr. and P.V. Nelson. 1992. A rapid method for determining physical properties of undisturbed substrate. *HortScience,* 271279-1280.

Rynk, R., M. van de Kamp, G.G. Willson, M.E. Singley, T.L. Richard, J.J. Kolega, F.R. Gouin, **L.** Laliberty, **Jr.,** D. Kay, D.W. Murphy, H.A.J. Hoitink and W.F. Brinton. 1992. *On-farm composting* ***handbook.*** Northeast Regional Agr. Eng. S ~ Ithaca, New **York.**

Sanderson, K.C. 1980. **Use** of sewage-refuse compost in the production of ornamental plants. *HortScience,* 15:173-178.

Shiralipour, A., D.B. McConnell and W.H. Smith. 1992. Uses and benefits **of** MSW compost: **A** review and an assessment. *Biomass and Bioenergy,* 3:267-279.

Vallini, ***G.*** A. Pera, F. Cecchi, M.M. Valdrighi and M.A. Sicurani. 1993. Compost stabilization of algal biomass drawn in eutrophic lagoon ecosystems. *Compost Sci. and Utilization,* 1(2):49-53.

Wootton, R.D., F.R. Gouin and F.C. Stark. 1981. Composted, digested sludge as a medium for growing flowering annuals. *J. Amer. Soc. Hort. Sci.,* 106:46-49.