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Growth of Hardy Chrysanthemums in Containers of Media Amended with Composted Municipal Sewage Sludge[1]

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Abstract

Four hardy *Chrysanthemum* X *morifolium* (Ramat) (chrysanthemum) cultivars were grown in peat sand media amended with 2 sources of sewage sludge compost at 50, 60 and 67% of the media by volume. Chrysanthemums growing in the 50% to 60% by volume composted sewage sludge treatments and top dressed with complete or only N slow-release fertilizers were comparable to plants growing in a commercially available potting medium with a complete fertilizer. Media containing 50 and 60% compost with a pH range of 6.2 to 6.9 supplied trace elements and most of the P and K necessary for normal plant growth. The use of a surfactant increased the fresh weight in some compost blends.

Index words: soluble salts, pH, slow-release fertilizers, urea

Introduction

Garden chrysanthemums are not a highly profitable crop for many growers, because they are widely grown and readily available. Since they are grown outdoors, the major production costs, excluding land and labor are: containers, growing media, liners, fertilizers and pesticides. Any reduction in the costs of these without sacrificing quality could make growing garden chrysanthemums more profitable.

Composted municipal sewage sludge has been found to be an acceptable organic amendment for blending potting media and a source of essential nutrients for plant growth (2, 3, 4, 5, 7). As municipalities adopt improved composting methods (6), products made from raw or digested sewage sludge will become more readily available. Optimizing the use of composted sewage sludge in formulating potting media for growing garden chrysanthemums could result in substantial savings in the cost of growing media and fertilizers and in simplifying production procedures.

Materials and Methods

Rooted cuttings of *C. morifolium* 'Minn Yellow,' 'Minn White,' 'Pan American' and 'Zonta' growing in 5 x 2.5 x 5 cm (2 x 1 x 2 in) cells in cell-packs with Pro Mix B X (Premier Co., New Rochelle, NY 10802) were planted 1 per pot in 3.4L (#3) nursery can in early June. The containers were filled with media containing equal parts of peat moss and builders grade sand amended with 50%, 60% and 67% by volume of compost made from: lime dewatered raw sludge and woodchips ("ComPro" pH 7.0, 23% C, 1.6% N, 2.0% P, 0.2% K, 9.2% Ca, 1.4% Mg, 0.4% S, 0.35% Al, 0.0027% B, 0.03% Cu, 5% Fe, 0.009% Mo, 0.077% Mn, 0.077% Zn, 0.008% Cd, 0.029% Pb, 0.005% Ni) supplied by Maryland Environmental Services, Annapolis, MD 21404; or polymer dewatered digested sewage sludge and woodchips ("Earthlife" pH 6.2, 20% C, 1.0% N, 2.0% P, 1.0% K, 1.0% Ca, 0.5% Mg, 0.1% S, 0.64% Al, 0.15% B, 0.05% Cu, 2.0% Fe, 0.04% Mn, 0.02% Mo, 0.2% Zn, 0.001% Cd, 0.025% Pb, 0.0078% Ni) supplied by Delchem Sales, Inc., Philadelphia, PA 19123. Both materials were composted using the Beltsville Aerated Extended Pile System (6) and screened through a 1.5 cm (0.6 in) mesh.

Similar plants were grown in a general potting mix (check) of 20% top soil, 40% peat moss, 20% perlite and 20% vermiculite (v/v/v/v) with 6 g/l (6 oz/ft^3) dolomitic limestone and 0.18 g/l (0.18 oz/ft^3) of FTE 503 (Fritted Trace Elements, W.R. Grace Co., Allentown, PA 18105) and 1.2 g/l (1.2 oz/ft^3) of granular surfactant (Aqua-Gro, Aquatrol Corp. of America, Pennsauken, NJ 08110) of medium. The surfactant was also incorporated into half of all media of each cultivar at 1 g/l (1 oz/ft^3) just prior to planting.

Treatments were completely randomized within replications and cultivars were treated as replications. The plants were grown as single pinch immediately after planting with 3 plants per treatment per cultivar. Media samples were taken initially to measure pH and soluble salts (mmhos/cm) and at harvest for measuring pH only. Soluble salt measurements were by saturated paste extract and pH measurements were by 1:2.5 dilution of media and 0.01M $CaCl_2$ reagent grade (1).

Immediately after planting, but before the initial watering one half of the plants received 1.5 G (0.053 oz) of N from slow-release fertilizer 38N-0P-0K (Osmocote 38-0-0, Sierra Chemical Co., Milpitas, CA 95035) and the other half received 1.5 g of N from slow-release 18N-2.6P-9.8K (Osmocote 18-6-12) both having the same release rate. The plants were hand watered when

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necessary and sprayed when needed to control insects. Plants were irrigated with 700 ppm of N from 46N-0P-0K (46-0-0 urea, Transnitro, Inc., Tampa, FL 33614) in early August and again in early September just as they began to exhibit slight chlorosis on the lower leaves due to N stress.

Flower bud counts were made in early October just prior to opening. Height and fresh weight of the tops, pruned near the medium surface were measured when 50% of the flowers were open. Since all cultivars responded similarly to treatments, and there were no significant differences between sources of compost, the data were analyzed as a 3 x 2 x 2 factorial. Plants growing in the general potting mix were evaluated but not included in the statistical analysis.

Results and Discussion

Increasing the concentration of compost above 60% by volume reduced the number of flower buds produced (Table 1). Plants growing in 60% compost produced more flower buds when the initial application was a complete fertilizer. There were no differences in fresh weight or height between initial fertilizer treatments. Surfactant had little effect in the number of flower buds produced but caused an increase in fresh weight of plants growing in 50% and 60% compost and top-dress with a complete fertilizer.

Chrysanthemums growing in media containing 50% and 60% compost with and without an initial application of a complete fertilizer with and without a surfactant, compared favorably with similar plants growing in the commercial medium receiving an initial application of a complete fertilizer. Plants grown in the commercial medium and fertilized with only N were unacceptable.

Mixes containing 60% "ComPro" contained higher soluble salt levels than all other mixes (Table 2). Plants in these mixes did not exhibit soluble salt toxicity symptoms. Although pH of media containing "Compro" were initially lower their final pH values were higher than other mixes.

Based on the evidence presented, marketable hardy chrysanthemums can be grown in potting mixes containing up to 60% by volume of compost made from either polymer dewatered digested sewage sludge or lime dewatered raw sewage sludge and top-dressed initially with a complete fertilizer. Although quality plants can be produced using only N, they will tend to have fewer flower buds. When used at the recommended rate, the compost appears capable of supplying most of the essential and trace elements necessary for plant growth as reported (2,7). The addition of surfactants appears to have some beneficial effect.

Significance to the Nursery Industry

Many retail nurseries grow hardy chrysanthemums to attract customers and to extend fall sales. Because hardy chrysanthemums are widely grown and readily available, they are not considered to be a profitable crop. With composted sewage sludge already being used in many nurseries and greenhouses, generally at 25% to 33% by volume, in potting mixes and up to 50 dry tons per acre in seed beds and production fields, the safety of the material has been demonstrated. Preliminary studies and this study indicate that chrysanthemums are tolerant to higher than recommended levels with a strong margin of safety. Composted sewage sludge automatically adjusts the pH of the mix, when used at 60% by volume and supplies all of the essential trace elements, eliminating the need to measure lime and trace element materials. This reduces chances for mistakes and labor. By using composted sewage sludge, nurserymen will also be helping to solve a major disposal problem.

Table 1. Growth response of *C. morifolium* 'Minn White,' 'Minn Yellow,' 'Pan American' and 'Zonta' as influenced by 3 levels of screened composted sewage sludge amended with 2 levels of surfactants and top-dressed with slow-release fertilizers.

Compost[z]	Fertilizer Source (1.5 g N/pot)[y]		Surfactant[w]	Flower buds	Fresh wt.	Height
(% by volume)	38-0-0	18-6-12	(g/l)	(Number)	(g)	(cm)
50		x	1	148 a[v]	343 a	35 a
"		x	0	137 ab	300 b	32 b
"	x		1	130 b	316 ab	32 b
"	x		0	125 bc	278 b	33 ab
60		x	1	139 a	324 a	32 b
"		x	0	140 a	288 b	31 bc
"	x		1	132 b	293 b	33 ab
"	x		0	126 bc	263 bc	31 bc
67		x	1	132 b	302 ab	33 ab
"		x	0	109 c	266 b	32 b
"	x		1	116 c	281 b	33 ab
"	x		0	111 c	258 c	31 bc
check[x]		x	1	153	322	32
"		x	0	130	270	31
"	x		1	62	67	27
"	x		0	69	73	30

[z]Blended with equal parts by volume of peat moss and sand.

[y]Grown in 3.4 l (6 in) nursery can.

[x]Commercial medium of v/v/v/v 20% soil, 40% peat moss, 20% vermiculite, 20% perlite with 6 g/l dolomitic limestone, 0.15 g/l of FTE and 1.2 g/l of Aqua-Gro.

[w]Granular Aqua-Gro.

[v]Means within a column followed by the same letter are not significantly different at the 5% level using Duncan's Multiple Range Test.

Table 2. **Soluble salt levels and pH of growing media amended with 2 sources of composted municipal sewage sludge.**

Sludge Source		Soluble Salts[y]	pH[x]	
Compro	Earthlife	(mmhos/cm)	initial	final
(Percent by volume)				
50		2.07 c	4.8	6.9
60		3.47 b	4.5	6.9
67		4.44 a	6.4	7.0
	50	1.28 d	5.5	6.2
	60	2.53 c	6.3	6.2
	67	2.23 c	6.3	6.2
check[z]		0.55	6.4	6.7

[z]Commercial mix of 20% soil, 40% peat moss, 20% perlite, 20% vermiculite amended with dolomitic limestone to a pH of near 6.5, 0.15 g/liter of FTE and 1.2 g/liter of Aqua-Gro.

[y]by saturated paste extract.

[x]by 1:2.5 dilutionusing 0.1M $CaCl_2$.

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Adventitious Root Formation in *Rosa Multiflora* 'Brooks 56' Hardwood Cuttings[1]

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Abstract

Production of Texas field grown rose bushes is inefficient with less than 60 percent of *Rosa multiflora* hardwood cuttings developing into marketable plants after two years of commercial production. Uniformity of rooting of hardwood cuttings differs between field location and time of year. Treatments consisting of Hare's powder, 0, 3000, 10000 mg/l IBA (0, 300, 10000 ppm), 2N H_2SO_4 acid treatment, NaOH solution pH 10.5 and/or wounding were established to test the effect of selected chemical and mechanical treatments on rooting hardwood *Rosa multiflora* cuttings propagated under field and greenhouse conditions. Results were comparable between field and greenhouse propagated hardwood cuttings. Best treatments were with Hare's powder and wounding, while acid, base and IBA treatments did not enhance rooting. The importance of determining the physiological condition of field stock plants for successful rooting of hardwood cuttings is discussed.

Index words: auxin, propagation, wounding, *Rosa multiflora,* rose

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Introduction

Texas is the second largest producer of field-grown rose bushes in the U.S. with an industry valued at more than 16 million annually. Growers traditionally field propagate hardwood *Rosa multiflora* cuttings in late