Since the primary objective of this study was to determine whether trickle irrigation could adequately establish chrysanthemum rooted cuttings compared to overhead methods and not to determine the best system for this purpose, we conclude that it appears that trickle irrigation can be used to perform this function. Regardless of season, trickle irrigation eventually was equal to or better than the other irrigation systems for the measured parameters. This seems to indicate that the need to keep plant foliage cool by wetting in order to establish transplants is not as important as expected.

These tests were conducted during periods of peak evaporative demand for typical seasons, so it is expected that trickle irrigation would perform as well during other less demanding times of the season. It should be stressed that a properly designed and managed trickle system is required in order to be effective for the sandy soils on which chrysanthemum production often occurs. Until testing under field conditions can be accomplished, caution should be exercised for total reliance on trickle irrigation for the establishment of chrysanthemum rooted cuttings. However, it does appear that if trickle is used in conjunction with overhead irrigation, less use of overhead and more of trickle irrigation could accomplish the same goal with substantial savings of water.

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RELATIVE PERFORMANCE OF SLUDGE COMPOST POTTING MEDIUM FOR CULTURE OF SEA OATS[1]

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Abstract. **Plant growth for sea oats (**Uniola paniculata, **L) grown in screened and unscreened sewage sludge compost was assessed by comparing plants grown in these 2 materials, combined with beach sand, with plants grown in 2 commercially available potting mixes which were used as standards. Fifteen individuals each of** U. paniculata **were grown for 4 months in 25-cm diameter containers in mixtures of beach sand and screened compost of 0:1, 1:3, 1:1, and 3:1 (v:v) and unscreened compost in the same ratios for a total of 10 different potting mix combinations, including the 2 standards. Growth was evaluated by means of a size index in which plant height and spread were summed. At the end of the growing period, plants in 3 potting mixes: Metromix 300, a 3 beach sand: 1 screened compost mix and a 1 beach sand: 1 screened compost mix exhibited significantly faster growth than those in the other 7, in terms of both size index and number of culms.**

Protection of the upland portions of sandy shorelines can be accomplished through the creation of barrier dunes and the stabilization of existing dunes (6). Barriers of vegetation are often planted to provide this protection. One of the most commonly used dune stabilization plants in the southeastern United States is sea oats (*Uniola paniculata* L.). Sea oats are a hardy native grass that can survive rapid sand accumulation, occasional flooding, salt spray, sandblasts, wind and water erosion, wide temperature fluctuations, drought, and low soil nutrients (6). Due to its ability to trap large volumes of sand, sea oats were one of the first Florida plants to be protected by law (9).

Although sea oats are the most important and widespread grass on Florida's coastal dunes (2), they are difficult to propagate from seed. The few nurseries that raise sea oats collect seed from the wild, with state permission, and through a separation process sort viable from nonviable seeds, which may make up 60% or more of the total harvest (O. Bundy, personal communication). Seedlings are raised in flats and are commonly sold as liners averaging 25-28 cm in height. For dune stabilization, staggered, parallel rows of sea oats are planted along the seaward face of the dune. Depending upon postplanting maintenance, mortality in liner sized plants can range from 40 to 50% (O. Bundy and T. Johnson, personal communications).

Grasses and woody ornamentals have been successfully grown in mixtures containing sewage sludge compost (4, 5). Sludge composting is the thermophilic decomposition of organic constituents into a relatively stable humus-like material (7). The organic matter in compost is particularly beneficial as a soil conditioner because it has been stabilized, decomposes slowly, and remains effective for a longer time than organic matter in uncomposted wastes. Compost can improve the physical properties of sandy soils through increased water content retention, enhanced aggregation, and increased microbial populations.

[1]Mention of any product or trade name is for identification purposes only and does not constitute an endorsement.

The objectives of this research were to determine the relative performance of mixtures of sludge compost and beach sand, as compared to 2 commercial potting mixes and to determine the relative performance of screened and unscreened sludge compost mixes in influencing growth in sea oats.

Materials and Methods

Liners of sea oats approximately 28 cm tall, were potted in 25-cm diameter black plastic containers. The sewage sludge compost medium was obtained from the Broward County Streets and Highways Division. The procedure used in composting the sludge for this project was the windrow method (8). In this method of composting dewatered sludge is mixed with a bulking agent, wood chips, and is formed into long lines, or windrows. These windrows are aerated by mechanical turning every 7-10 days for a 30-day period and are then moved to a holding area and cured for an additional 30 days. The bulking agent may then be screened from the compost and reused. Four compost mixes contained beach sand(s) unscreened compost (UC) in ratios of 0:1, 1:3, 1:1, and 3:1 (v:v). Another 4 compost mixes contained screened compost (SC), from which the wood chips were removed with a Royer® separator, and beach sand in the same ratios. Of the 2 commercial potting mixes, 1 consisted of peat:vermuculite:perlite:sand:composted pine bark (Metromix 300; ratio of ingredients not available from manufacturer [HM_a]) and the other consisted of muck ("Florida peat"):sawdust:sand (3:5:2, by volume) (HM_b). Both were purchased from local vendors. Certain physical characteristics of the potting mixes are given in Table 1.

All plants were fertilized with the recommended rates of 18N-3P-10K Osmocote (42g/container) and Micromax (6.9 g/container), were grown in full sunlight, and received overhead irrigation daily. Plant growth was evaluated at 2-week intervals through the use of a size index in which plant height and average spread (in centimeters) were measured and summed. All data were evaluated with the analysis of variance and the Tukey test (HSD) was used to compute the confidence limits of the mean size index values.

Results and Discussion

Growth of sea oats as influenced by potting mix composition is shown in Table 2. While there were no significant differences in size index at the beginning of the production period, significant differences attributable to potting medium composition did become apparent by the end of the first 6 weeks of production. The basic patterns of difference persisted, although the amplitude of difference changed during the remainder of the 15-week production period. At the end of the production period, the average size indices of sea oats were the highest in 6 potting mixes: s:uc (1:1), s:uc (3:1), s:sc (1:1), s:sc (3:1), sc, and HM_a. The Tukey procedure illustrated some overlap between some treatments, but one treatment, s:uc (1:3) had the slowest growth and was, in fact, significantly slower than all of the other 9 treatments.

At the beginning of production, the culms were counted and no significant differences in the number of culms occurred (Table 2). After 16 weeks, 3 mixes, HM_a; s:sc (1:1); and s:sc (3:1), showed significant differences in the number of culms produced. These 3 potting mixes proved superior to the other 7 when both size index and culm production were regarded.

The primary functions of media are to provide ideal environments for root growth and an adequate base for anchoring plants (3). The treatments using unscreened compost contained bulky particles without uniform size which could have adversely affected the waterholding capacity and the aeration in these media. Mortality was highest in the mixes containing unscreened compost (Table 2) and size indices would have been lower had mortality been factored into the analysis of variance. The s:uc (3:1) was an exception to this, possibly because it contained such a large proportion of sand.

Two of the sludge compost mixes, s:sc (1:1) and s:sc (3:1) performed better than the others, in terms of both size index and culm production. In these 2 mixes, 80% or more of the material ranged between sieve size 40-60. It is likely, therefore, that this could be the optimum range for sea oats. It is not as likely that pH values within the 5.33-8.23 range (Table 1), are significant in defining an optimum growth environment for sea oats.

HM_a contains soil amendments including an undisclosed amount of supplemental fertilization. These amendments may have contributed to this medium's superior performance.

Relative lack of pronounced growth rate separation in Table 2 for the August 13 measuring date may have been due to the faster growing plants exceeding their optimum growth time in 25-cm containers. With certain of these potting media optimum growing time for sea oats in this size container may be closer to approximately 3 months, rather than 4.

The objective of any good potting medium is to produce a quality plant in the shortest time period with the lowest total production costs (3). Commercially available potting mixes used in this project ranged in price from $12.43 to 60.25/m^3. Sewage sludge compost prices range from $2.87

Table 1. Physical parameters of container media used for culture of sea oats (*Uniola paniculata*) in 25-cm diameter containers.

Medium[z]	pH	Bulk density (g/ml)	Weight percent composition (sieve size)							
			10	20	40	60	80	100	200	>200
s:uc (1:3)	7.29	0.77	21.0	9.3	44.3	21.7	2.0	0.8	0.083	0.17
s:uc (1:1)	8.05	0.97	8.3	6.0	53.7	27.3	3.3	0.8	0.7	0.11
s:uc (3:1)	8.23	1.12	3.7	4.2	58.3	29.0	3.5	0.75	0.52	0.10
s:uc (0:1)	6.27	0.54	64.3	18.1	9.5	4.5	1.5	0.56	1.04	0.33
s:sc (1:3)	7.12	0.80	20.9	13.2	36.0	25.1	3.13	0.72	0.79	0.18
s:sc (1:1)	7.55	1.03	8.4	8.7	55.7	23.4	2.6	0.43	0.47	0.17
s:sc (3:1)	7.86	1.20	3.9	4.6	62.0	25.0	3.3	0.52	0.43	0.25
s:sc (0:1)	6.05	0.54	49.4	30.9	12.4	3.9	1.4	0.48	0.48	0.38
HM_a	5.33	0.23	29.2	32.5	17.6	9.0	4.3	1.49	3.7	1.50
HM_b	7.14	0.51	18.8	18.8	29.3	19.9	7.5	2.9	2.6	0.33

[z]s = beach sand; uc = unscreened sewage sludge compost; sc = screened sewage sludge compost; HM_a = commercially available horticultural medium composed of peat:vermiculite:perlite:sand:composted pine bark (Metromix 300; ratio of ingredients not released by manufacturer); HM_b = sawdust:muck ("Florida peat"):sand(5:3:2, by volume).

Table 2. Growth of sea oats (*Unicola paniculata*) in 25-cm diameter containers as influenced by potting medium composition.

Medium[z]	Average size index (N = 15)[yx]				Number of culms	
	April 30	June 18	July 16	August 13	April 23	August 27
s:uc (1:3)	44.6 a[t]	59.2 d	102.6 d	150.1 d[x]	2.3 a	29.1 d
s:uc (1:1)	46.0 a	79.7 bcd	133.6 bc	177.9 abcd[w]	2.4 a	37.8 bcd
s:uc (3:1)	42.5 a	104.8 ab	156.7 a	189.1 abc	2.2 a	35.3 cd
s:uc (0:1)	52.0 a	65.2 cd	130.2 bc	163.0 cd[v]	2.5 a	35.6 cd
s:sc (1:3)	44.4 a	84.2 bcd	131.1 bc	172.3 bcd	2.7 a	39.7 bcd
s:sc (1:1)	50.4 a	98.6 ab	157.1 a	190.9 ab	3.0 a	51.7 ab
s:sc (3:1)	44.2 a	115.6 a	165.2 a	196.5 ab	3.3 a	48.9 abc
s:sc (0:1)	46.1 a	91.2 abc	148.9 ab	183.6 abc[u]	2.7 a	42.5 bcd
HM_a	46.6 a	100.1 ab	161.7 a	205.7 a	2.6 a	58.6 a
HM_b	37.1 a	66.4 cd	115.6 cd	162.7 cd	2.7 a	33.7 d

[z]s = beach sand; uc = unscreened sewage sludge compost; sc = screened sewage sludge compost; HM_a = commercially available horticultural medium composed of peat:vermiculite:perlite:sand:composted pine bark (Metromix 300®; ratio of ingredients not released by manufacturer); HM_b = sawdust:muck ("Florida peat"):sand (5:3:2, by volume).
[y]Size index = height + [(Diam 1 + Diam 2)/2].
[t]Mean separation within columns by the Tukey test (HSD), 5% level.
[x]Mortality: 1 of 15.
[w]Mortality: 3 of 15.
[v]Mortality: 5 of 15.
[u]Mortality: 2 of 15.

to $26.75/m³ (1) with an average price of approximately $5.35/m³. Potting mixes using sewage sludge compost may prove to be an economical method of raising selected nursery plants for growers.

In general, 3 potting mixes showed significant differences in growth and culm production for sea oats. Other work in this area should include investigating the optimum potting mix component ratios for these materials and also evaluating the optimum growing time for sea oats for a variety of container sizes.

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GERMINATION OF NANDINA DOMESTICA SEED AS INFLUENCED BY GA_3 AND STRATIFICATION[1]

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Abstract. **Delayed germination of** Nandina domestica **Thunb. seed is the result of rudimentary embryo. Although seeds ripen in late winter, germination does not occur until the next fall. Treatments of 1000 ppm GA_3 for 24 and 48 hr and alternating cold-warm (4-30°C) moist stratification for 6 and 12 weeks, resulted in erratic and poor germination. Cold-warm/warm-cold and warm stratification alone had little effect. Cold stratification for 6 and 12 weeks without GA_3 pretreatment improved germination. Seeds of** N. domestica **when stored at 3-5°C remain viable and will germinate uniformly and rapidly in spring.**

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Nandina domestica, commonly known as nandina; heavenly bamboo; or sacred bamboo, is a monogeneric, monotypic taxon, in Nandinaceae (7, 10). It is frequently used as a landscape plant in north-central Florida but is cold hardy to Zone 6 (2). A slow growing plant that may reach a height of 2 m, it has bright green tri-pinnately compound leaves, which change to a red-bronze color from winter through early spring. Several erect panicles of numerous creamy-white flowers appear in August and September and are followed by masses of bright red berries in fall. Nandina is most attractive when planted in groups. Two cultivars exist; one with white berries (*N. domestica* 'Alba') and a compact dwarf form (*N. domestica* 'Atropurpurea Nana'), with consistently red leaves, often used for foundation plantings.

A consensus in most horticultural manuals is that *Nandina* can be propagated by cuttings as well as seed. The cuttings are extremely slow to root and seeds do not germinate until mid to late fall regardless of planting time (2, 4, 5). In the only known research work on propagation of nandina seeds, Afansiev (1), using a number of treat-