The Use of Composted Tree Chippings as a Potting Medium

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INTRODUCTION

Wood wastes are extensively used in potting media, with pine bark and sawdust dominating most types of container mixes in Australia. However, there are other wastes and by-products that, with appropriate treatment, could also be used as media components. In the United States there is a great range of composts available for container mixes, some being derived from construction wood wastes and sewage sludge (Mecklenberg, 1993). This paper discusses the use of one of these materials—composted tree chippings. It looks at both the production and current use of the material, as well as trials to compare and evaluate its performance as a medium.

Currently the Box Hill City Council nursery uses this material extensively in different mixes used in the production of a wide range of species. Its use forms part of an overall strategy at the nursery to minimize the use of non-renewable resources and reduce the use of horticultural chemicals.

The research component of this paper was undertaken during 1992 and 1993 as part of a project conducted by the senior author at the Victorian College of *Agriculture and Horticulture, Burnley Campus (V.C.A.H.-Burnley).*

PRODUCTION OF COMPOSTED TREE CHIPPINGS

Tree chippings are a relatively plentiful resource within the Box Hill City Council as a result of the council's tree maintenance activities. The fresh chips are held in heaps at the rear of the nursery, then are laid out as a mulch over the ground surface in outdoor pot standing areas and on glasshouse floors.

The chips are effective as a weed suppressant, and assist in drainage of all outdoor areas. *They are spread to a depth of between 150 to 200 mm, with 40* m^3 *of material* covering approximately 200 m^2.

The chips remain as a surface mulch in the standing areas for a minimum of 12 months. Following this period on the ground the chips have undergone considerable decomposition and are much changed. The now dark coloured "compost" ranges from fine particles to larger woody pieces, and has a rich, loamy texture. The material is lifted and placed into heaps for its use as a potting medium. The compost may sit for between 2 to 4 months, depending on potting requirements. Prior to its incorporation into a mix the compost is passed through a mixer with a 10-mm sieve ensuring removal of the larger woody pieces. The sieved compost is then mixed with various aggregates and fertilizers to achieve the composition required. The compost is normally used in the proportion of approximately 80% of each mix by volume.

The most common component additions to the mixes include coir fibre dust, rice hulls, recycled plastic, and polystyrene. Propagation, indoor, and general mixes are all produced at the nursery using the compost as a major component. The range of plants grown at the nursery includes exotic ornamentals, display specimens, potted colour, indigenous plants, and advanced containerized trees.

MATERIALS AND METHODS

Trial # 1. A compost-based mix used at Box Hill Council nursery was compared with two commercial mixes. All three media contained similar supplementary fertilizers, with the nitrogen amount standardised in each mix. In addition, a fortnightly liquid feed of 192N-34P-162K mg/litre was applied to the pots over the first eight weeks. The components of each mix were as follows (per m^3):

Mix A (commercial mix)		
Pine bark (medium)	2	parts
Pine bark (medium/fine blend)	2	parts
Sand	0.5	parts
Osmocote (3/4 month 18N-4.8P-9.1K)	2	kg
Micromax	1	kg
IBDU	800	g
Gypsum	450	g
Dolomite	1	kg

Mix B (commercial mix)		
Pine bark (medium)	7.5	parts
Sand (coarse)	1.5	parts
Rice hulls (sterilized)	0.5	parts
Peat moss	0.5	parts
Osmocote (3-4 months 18N/4.8P/9.1K)	2	kg
Micromax	1	kg
IBDU	800	g

Compost mix		
Composted chippings	8	parts
Plastic pellets (hard)	1	part
Polystyrene	2	parts
Coir fibre dust	1	part
Iron (GU49)	1	kg
Osmocote (3/4 month 18N-2.6P-10K)	2	kg
Micromax	1	kg
IBDU	800	g

Tubestock of *Cytisus* × *racemosus* (Syn. *Genista* sp.), *Escallonia laevis* [syn. *E. organensis*], *Brachycome multifida* fine-leaf form, and *Argyranthemum frutescens* were potted into 140-mm containers of the mixes on the 9 October 1992. There were 10 replicates of each treatment (species/medium). The pots were randomized in outdoor growing areas at the campus nursery, under overhead sprinkler irrigation. The plants were destructively harvested on 10 January 1993 approximately 13 weeks after the commencement date. The stems, shoots, and leaves of each plant were removed at the base, dried at 80C and weighed.

Trial # 2. In this trial, a medium of pure sieved compost and supplementary fertilisers was compared with a commercially produced pine-bark-based medium. Both mixes had similar levels of supplementary fertilizers, with the nitrogen component standardised in each mix. All pots received a fortnightly liquid feed, as in Trial # 1. The mix components per cubic metre were:

Mix X (commercial mix)		
Pine bark (medium)	2	parts
Pine bark (medium/fine blend)	2	parts
Sand (coarse)	0.5	parts
Nutricote (3/4 month 16N-4.4P-8.3K)	2	kg
Micromax	1	kg
Iron (slow-release)	1	kg
IBDU	800	g
Dolomite	1	kg
Gypsum	450	g

Compost mix		
Compost (sieved)	1	m3
Nutricote (3/4 month 16N-4.4P-8.3K))	2	kg
Micromax	1	kg
Iron (slow-release)	1	kg
IBDU	800	g
Gypsum	450	g

Tubestock of *Correa* 'Dusky Bells' and *Verbena* × *hybrida* were used. There were two watering regimes—overhead sprinklers in the outdoor growing area, and capillary sandbed irrigation—with 10 replicates of each treatment (species /mix / irrigation) in a randomized block design.

The trial commenced on 11 March 1993, when the tubes were potted into 140 mm containers of each mix. The trial concluded on 23rd April, 1993, some 6 weeks later, when the plants were destructively harvested as in trial #1.

Selected physical and chemical properties of the media were determined at potting and at harvest. The pH and electrical conductivity (EC) of the media were assessed by the 1 : 1.5 volume method. Measurements of air-filled porosity (AFP) and bulk density (BD) of the media were also taken. The methods used are described in the

Australian Standard for Potting Mixes (Standards Australia, 1989). The harvested plant tops were dried at 80°C and weighed.

RESULTS

Table 1. Some properties of the media in Trial # 1.

	pH		EC (µs/cm)		AFP (%)		BD (g/cm3)	
	Pot.	Har.	Pot.	Har.	Pot.	Har.	Pot.	Har.
Mix A	5.7	5.6	197	103	14	-	0.36	0.30
Mix B	5.7	5.6	355	142	18	-	0.37	0.30
Compost Mix	6.0	6.0	410	281	24	-	0.19	0.18

Table 2. Some properties of the media in Trial # 2.

	pH		EC (µs/cm)		AFP (%)		BD (g/cm3)	
	Pot.	Har.	Pot.	Har.	Pot.	Har.	Pot.	Har.
Mix X	6.0	6.0	937	193	14	-	0.32	0.39
Compost Mix	6.2	6.5	796	615	18	-	0.20	0.25

Table 3. Shoot dry weights (g/pot) - Trial # 1.

	Mix A	Mix B	Compost mix
Cytisus × *racemosus*	27.9	28.4	21.6
Escallonia laevis	24.3	25.6	17.4
Brachycome multifida	23.6	23.0	18.0
Argyranthemum frutescens	8.8	9.7	6.8

Table 4. Shoot dry weights (g/pot)—Trial # 2.

	Capillary sandbed		Overhead irrigation	
	Mix X	Compost mix	Mix X	Compost mix
Correa 'Dusky Bells'	4.4	4.1	4.0	3.4
Verbena × *hybrida*	4.5	5.4	5.5	7.2

DISCUSSION

Properties of the Media (Tables 1 and 2).

pH. The pH values of the compost media fell within the range of suitability for most plant species. There were no high pH values recorded, as has been the case with some other wood waste composts (Mecklenberg, 1993). However, for some plants the pH may be too high and adjustment necessary.

Electrical Conductivity. The EC values fell well within the range of being suitable for container growing.

Air-Filled Porosity. This proved to be a problem with the first trial where the AFP of the compost mix was considerably higher compared to the two pine-bark-based mixes. This slightly disadvantaged the compost mix, particularly when coupled with overhead irrigation difficulties as the trial continued into the Christmas / New Year period. The greater pore space of the compost mix in relation the two commercial mixes under the same irrigation frequency meant that the compost mix was drying out more between irrigations, thus placing the plants under greater stress. More frequent irrigation may have reduced the differences between the mixes, however media with similar initial AFP would have been preferable.

Bulk Density. The lower bulk densities of the compost media could be both a benefit and a problem. In some situations it may be necessary to add some ballast to the mix (e.g., sand) to provide some pot stability. However in other situations, such as transport, the comparative lightness of the mix would be a bonus.

Volume Drop. Decomposition of the compost mix caused some shrinkage in the mix volume during trial #1. This was observed to be between 10 to 20 mm from the initial potting height in the container. This was not observed in trial #2. This has been noted as a problem with other wood waste composts (Mecklenberg, 1993).

Variability of the Compost. The compost will always have a level of variability in its composition. This is due to a number of factors including the different species and pruning undertaken, the type and quality of the chipper used to make the chips, and the composting process itself. This variability helps to explain some of the features observed. This may restrict its role in some situations (i.e., specialized propagation mixes). More effective composting of the chips, as is undertaken with pine bark and sawdust, (Bunt, 1988) will reduce variability.

Dry Weight Measurements (Tables 3 and 4). In trial # 1 shoot dry weights of all species were significantly lower for plants in the compost mix than of those in the two commercial mixes (Table 3). Results were different for trial #2. Verbena shoot dry weights were significantly higher in the compost mix compared to the commercial mix, whilst Correa shoot dry weights were not significantly different in either medium (Table 4).

It is difficult to totally explain these differing results. The longer trial # 1 (13 weeks) produced poorer results for the compost medium than in trial # 2 (6 weeks). The higher air-filled porosity (AFP) of the compost mix in the first trial was certainly a factor in these results. In the second trial the AFP of mixes was much the same.

Perhaps a more significant factor involved was nitrogen draw-down of the compost mix, particularly over the latter 5 weeks in trial # 1 when there were no applications of liquid nitrogen fertilizer. Nitrogen draw-down is common to many low-nitrogen organic materials used in potting media, such as barks and sawdusts. Composting of the material and/or the addition of nitrogen fertilizers must be used before some materials can be used in potting mixes (Handreck and Black, 1991). It has also been noted as a problem with other wood waste composts produced in the United States (Gouin, 1992). No assessment of nitrogen draw-down of the compost or other mixes was made during the trials. However the levels of nitrogen in pre-plant and liquid fertilizers applied during both trials were greater in comparison to nitrogen levels in fertilizer "recipes" referenced elsewhere (Handreck and Black, 1991). More effective composting of the chips prior to their incorporation into potting mixes would reduce the problems of nitrogen draw-down.

CONCLUSION

Based on the healthy plants produced at Box Hill Council nursery and the experimental results, composted tree chippings are an effective medium for container crops. With greater compost development and manipulation of ingredients it may prove to be a material that can meet the needs of many growers. Alternatively, there may be a place for production and sale of the compost for the nursery industry. This has proven to be the case in the United States, where patented composts are marketed widely (Gouin, 1992), particularly where the compost has proven benefits to the grower. One of these benefits which has not been discussed in this paper is the ability of composts to biologically suppress pathogens in potting mixes (Mecklenberg, 1993; Handreck and Black, 1991). This feature has certainly been noted at Box Hill Council Nursery, and well documented by others. Given that research on the use of pine bark as a potting material was undertaken over a long period of time (Aaron, 1991), further study on the use and applications of this material would be desirable.

There is increasing concern in the wider community about the use of non-renewable resources and the need to look towards alternatives which are more environmentally friendly. In particular in the nursery industry, where the use of alternatives to peat moss are being evaluated for their effectiveness (Pryce, 1991). It seems appropriate therefore that composts are making a return to use in potting media.

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