

## Recycling Green Nursery Waste

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**Because landfills are filling at a rapid pace, many states have enacted regulations prohibiting or restricting the disposal of yard waste in landfills. Container nurseries generate about 60 yd<sup>3</sup> (46 m<sup>3</sup>) of organic waste per acre per year (113 m<sup>3</sup> ha<sup>-1</sup>). By grinding and composting these wastes a nursery can save in two ways: (1) it does not need to pay to dump the waste, and (2) it does not have to purchase organic matter for growing media. The return on investment can be as high as 171% within 3 years in California. Nursery waste has better C:N ratios than most organic matters and recycling these wastes also recycles the nutrients.**

### INTRODUCTION

Our landfills are filling fast and many states have enacted regulations governing disposal of wastes. For example, California has passed AB 939, 1820 and 3992, which requires that counties divert 25% of their waste from landfills by January 1995 and 50% by January 2000 (California, State of, 1990). Container nurseries generate about 60 yds<sup>3</sup> (46 m<sup>3</sup>) of organic matter waste per acre per year (113 m<sup>3</sup> ha<sup>-1</sup>). I foresaw some of the problems with disposal of nursery wastes, and I began to study the possibility of recycling these wastes in 1990.

Wastes of biological origin are compostable wastes. Compostable wastes generated by nurseries are prunings, scrap lumber, dead plants, weeds, old stakes, discarded plants, paper and cardboard. Organic waste generation by nurseries varies with the kind of crop grown and the turnover rate. In one study, it was found that a container nursery can generate 60 yd<sup>3</sup> of waste per acre per year (113 m<sup>3</sup> ha<sup>-1</sup>). This waste can be ground and composted. After grinding, this volume decreases 20% to 72% depending on the kind of waste. Tub grinders, similar to the hay grinders farmers use — but much heavier duty, are used to grind wood and plant waste. Some of these grinders are built to grind tree stumps and logs. However, it is more efficient to use a chipper to cut up limbs having diameters greater than 1 in. (2.54 cm). Following chipping, the waste can be reground in a tub grinder. General prunings, paper and cardboard can be put directly into the tub grinder. There are numerous kinds of tub grinders on the market ranging in price from \$12,000 to \$350,000. Chippers range in price from \$7,000 to \$22,000. These costs may sound out of reach for nurseries, but the cost analyses I have done indicates otherwise. To stimulate recycling, California has provided a tax credit incentive of 40% of the cost of such equipment up to \$250,000.

Many people have a fear of allelopathic chemicals in raw plant waste used as organic matter sources. Wastes such as eucalyptus, walnut, Brazilian pepper, cedar, and redwood have been considered allelopathic by many. We have been using redwood sawdust for many years with no problems. I recently conducted an experiment with eucalyptus, considered by many to be phytotoxic. In this test, I

used raw as well as composted eucalyptus in growing media. I had a mean relative growth of 93% in 100% raw eucalyptus waste growing medium compared with 105% relative growth in 100% composted eucalyptus waste. The check was composed of well-composted sawdust plus soil. An alternative treatment of 75% peat and 25% soil had 109% relative growth. There was a slight decrease in the growth in the 100% eucalyptus waste which may have been due to poor water relations since the medium was very coarse in nature and its water holding capacity was poor. Composting generally will decompose or render allelopathic chemicals inactive and the fear is unfounded. Composting should be considered standard practice.

Tipping or dumping fees for disposal of yard waste to landfills varies throughout the country. The average for the country is \$25.60 per ton (Glenn, 1992). However, this fee does not include the cost of the rental of a disposal box which is kept on the property of the waste generator. In southern California, disposal costs vary from \$3.17 to \$7.00 per  $\text{yd}^3$  ( $0.77 \text{ m}^3$ ). A nursery that grinds its wastes and composts them for reuse in growing media saves in two ways: (1) it does not have to pay a dumping fee, and (2) it does not have to purchase organic matter for its media. The savings can be substantial.

A side benefit of recycling waste is nutrient recycling. Ground nursery waste has a superior nutrient composition compared with sawdusts or peat moss (Table 1). Its C : N ratio is approximately 23 : 1. This ratio may vary depending upon the percent of prunings present in the waste. In contrast, the C : N ratio of raw sawdusts ranges from 315 to 1000 : 1; barks range from 274 to 490 : 1 and peatmoss ranges from 48 to 90 : 1.

**Table 1.** Chemical composition of ground nursery waste<sup>2</sup>

$\text{Kgm}^3^{-1}$							
pH	DSm <sup>-1</sup>	N	P	K	Ca	Mg	Fe
5.7	6.00	2.60	0.196	1.01	1.96	0.59	0.88
Mn	Zn	Cu	Na	B	Bd <sup>y</sup>		
0.047	0.013	0.005	0.071	0.005	200		

<sup>2</sup>Extraction with 6N HCl, 16h

<sup>y</sup>Bulk density, dry wt

Because ground nursery waste has such an excellent C : N ratio, it composts quickly and there is no need to add additional N to the compost pile. Also, because of its nutrient content, the composting waste quickly reaches 155°F (68°C) which is important to kill pathogens and weed seeds.

## THE ECONOMICS OF RECYCLING WASTES

A cost analysis of processing green waste indicates it costs \$0.48 to 0.52 per yard (0.77 m<sup>3</sup>) to grind nursery waste with a tub grinder. This includes fuel, labor, and maintenance. Because there is a reduction in volume between 20% and 72% after grinding, the cost to process a yard<sup>3</sup> (0.77 m<sup>3</sup>) of ground waste in California is \$1.71. However, if you compare this cost to what one has to pay for sawdust, bark or peat, the saving is great. In addition to savings created by not having to purchase organic matter for growing media, one can save the cost of disposal of the original waste. Since the original, unground waste is loose, much of that yard of waste is air. In California the cost varies between \$3.17 to \$7.00 per yard to dispose of that waste. The value of the organic matter plus the savings from not having to dispose of the waste, can be substantial. The potential savings per yard of processed waste may be \$21.61/yard or more. Table 2 lists minimal waste disposal savings. These savings can be higher in different parts of the country or due to the method of disposal.

**Table 2.** Potential savings per yard (0.77 m<sup>3</sup>) of processed waste.

Value of organic matter	U.S. \$	12.00
Cost to process <sup>z</sup>		- 1.71
Waste disposal <sup>y</sup>		11.32
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Total	U.S. \$	21.61

<sup>z</sup> \$0.48 divided by 0.28 (28% remaining in volume after grinding)

<sup>y</sup> \$3.17 divided by 0.28

By using the formula:

$$\frac{\text{Cost of Grinder}}{(\text{VOM} \times \text{VR}) - (\text{CTP}) + \text{DFS}}$$

one can determine the number of yards of loose waste which must be processed to recover the cost of the grinder, where VOM = value of the organic matter, VR = volume remaining after grinding, CTP = cost to process and DFS = disposal fee saving. With this formula, 4,473 yd<sup>3</sup> (3420 m<sup>3</sup>) of waste would have to be processed to recover the cost of a \$27,063 grinder. A 25 acre (10.13 ha) nursery generating 60 yd/acre/yr (113m<sup>3</sup>ha<sup>-1</sup>) would recover the cost of the equipment in 3 years. The recovery of costs is comparable regardless of the size of the nursery, even if the larger nursery has to purchase a larger, more expensive grinder. In addition, the State of California offers a 40% tax credit for grinding equipment (California, State of, 1989). Consequently, a 100 acre (40.5 ha) nursery purchasing a larger piece of equipment costing \$81,000 would realize a return of 171% on their investment in 3 years! This is a conservative estimate!

## **CONCLUSIONS**

Recycling nursery green waste is a viable means to reduce our landfill loading and is economically rewarding for the nurseryman to do so. Because nursery waste comes from well-fed nursery stock, the nutrient composition and C : N ratios are excellent. Recycling the waste reduces the need to supply extra N to the composting process and reduces the demand for excessive N as is necessary with some highly carbonaceous growing media. Because nursery waste heats up readily to pasteurization temperatures, the need for fumigation of the organic fraction is eliminated.

## **LITERATURE CITED**

**California, State of**, 1990. AB 939: Ch 1095, AB 1820: Ch 145, AB 3992: Ch 145.

**California, State of**, 1989. AB 1308.

**Glenn J.** 1992. The State of Garbage in America. *Biocycle* Apr:46-56.