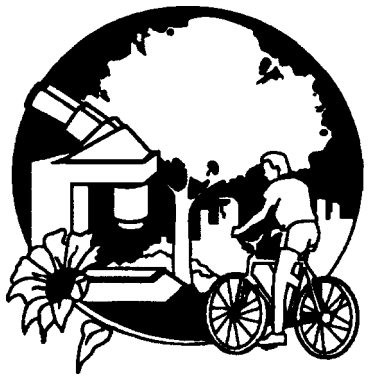
GROWING Points

Department of Environmental Horticulture • University of California, Davis
http://envhort.ucdavis.edu



Composted Green Waste as a Container Medium Amendment for the Production of Bedding Plants, Chrysanthemums and Woody Perennials

D. W. Burger, Professor, Dept. of Environmental Horticulture, T. K. Hartz, Extension Specialist, Dept. of Vegetable Crops, and G. W. Forister, Staff Research Associate, Dept. of Environmental Horticulture, UC Davis

Per capita, California homeowners are estimated to produce 180 kg (397 lb.) of green waste (lawn clippings, tree/shrub prunings) per year (Statutes of California and Digests of Measures, 1989). This green waste is a significant component of the municipal waste stream that can be reused or recycled. In 1989, Californians passed legislation requiring every city and county to divert 25% of all solid waste from landfills through source reduction, recycling and composting by January 1, 1995. By January 1, 2000, these municipalities will be required to divert 50% of their solid waste.

While the legislation permits any strategy (reduction, recycling) to reduce the amount of green waste, the method of greatest interest to horticulturists is composting. The goal of this study was to assess the suitability of composted green waste (CGW) as a growth medium and to compare the growth of various short-term and long-term horticultural crops in varying blends of CGW with growth in a standard medium (UC Mix).

The use of composted plant materials as an amendment to soils is a well-established horticultural practice. Compost can be added to garden soils to increase water holding capacity and provide organic matter. It can also be used as a constituent of soilless container media. CGW may be a viable material to grow plants or to use as an amendment to existing container media. Compost has been shown to be an effective medium constituent and it has been reported to possess some disease suppression abilities. If challenges associated with the use of CGW can be overcome (e.g., variation in physical and chemical properties, shrinkage), it may be a satisfactory container soil amendment.

The gradient of growth in and flowering response to varying mixes of composted green waste and UC Mix is shown in Catharanthus roseus Don. 'Little Pinkie', vinca *seedlings above. Seedlings in lower left were planted in 100% compost; seedlings in back right were planted in 100% UC Mix.*

Materials and Methods

General procedures. Crops were chosen for this study based

In This Issue...

on their importance to the greenhouse, nursery and bedding plant industries, responsiveness to soil conditions, and cropping time. Three bedding plant species (marigold, petunia and vinca) were chosen to study seed germination and early seedling development over a relatively short period (4-6 weeks). Chrysanthemum was chosen to study early growth and development of rooted cuttings in various CGW:UC Mix blends. Three shrubs (photinia, pittosporum, and juniper) were chosen to assess the use of CGW:UC Mix blends for growing plants in containers over the long term (6-8 months).

Blends of four samples of CGW (CGW from each of two composting operations at two times of the year) were made with UC Mix. CGW was obtained from operations in Sonoma County, CA (samples 1 and 2) and San Diego County, CA (samples 3 and 4); feedstock was ground municipal yard and landscape waste, with no paper, food wastes or other materials.

Samples were collected from Nov. 1993 to Apr. 1994; composting time was 2-3 months. All samples were stored moist in plastic bags and screened through 12-mm mesh before use. All CGW samples were evaluated for the production of bedding plants, two samples (samples 1 and 3) for chrysanthemum and one (sample 1) for woody ornamentals. CGW was blended with UC Mix (1:1:1, by volume, sand, redwood sawdust, peat moss) in the following proportions (CGW:UC Mix): 1:0, 3:1, 1:1, 1:3, 0:1. The resulting media were distributed into various sizes and types of containers as follows: 8 x 16 cell-plug trays (plug size = 3 x 3 x 5 cm) for germination of marigold, petunia and vinca; six-packs (cell size = 4 x 6 x 5.7 cm) for marigold, petunia and vinca; 530-mL pots for marigold, petunia and vinca; 1800-mL pots for chrysanthemum and 3.8-L containers for *Pittosporum*, *Photinia* and *Juniperus*.

CGW samples (50 g, three per CGW sample) were characterized using the following analyses: 1) electrical conductivity (EC, $dS \cdot m^{-1}$); 2) cation exchange capacity (CEC, $mol(+) \cdot kg^{-1}$); 3) percent N, C, P, K and ash ; and 4) total mineral N (NH_4-N + NO_3-N, $mg \cdot kg^{-1}$) for fresh (at collection) and aged (at planting) CGW.

A controlled-environment, aerobic incubation was performed within 10 days of collection to determine short-term nitrogen mineralization/immobilization. A moist 9:1 soil : CGW blend (w/w) was moisture equilibrated under 25 kPa pressure then incubated at constant moisture at 30 °C for 14 days, followed by extraction in 2N KCl. The change in mineral-N concentration over the incubation period represented net mineralization/immobilization.

The presence of phytotoxic compounds was determined through a tomato (*Lycopersicon esculentum*, Mill. 'Brigade') seed bioassay. Eight grams of dry CGW and 40 mL distilled water were shaken for 2 hours then filtered to remove particles; the extract was diluted 1:1 with distilled water. Seven mL of solution were added to a petri dish containing a filter paper blotter. Tomato seeds were added and the petri dishes incubated three days at 23 °C. A germination index (GI) was calculated by the following formula:

$$GI = \frac{\%\ \text{germination in compost}}{\%\ \text{germination in distilled water}} \times \frac{\text{mean radicle length in compost}}{\text{mean radicle length in distilled water}} \times 100$$

Bulk density, water holding capacity and air-filled porosity (AFP) were determined for selected CGW:UC Mix blends.

Germination of bedding plants. Seeds of marigold, petunia and vinca were placed 1-5 mm deep in plug trays (two seeds per cell) containing various CGW:UC Mix blends. Each plug tray was irrigated (leached) with at least two volumes of a half-strength (EC = 1.1 $dS \cdot m^{-1}$) Hoagland's solution #2 (Hoagland and Arnon, 1950) before seeds were introduced. Each species was randomly assigned to two 4 x 5 cell blocks within each plug tray (40 seeds per block, two blocks per plug tray = 80 seeds germinated for each species). Plug trays were placed under mist in a greenhouse held at 26-30 °C until seeds germinated. Germinated seedlings were counted and germination percentages were calculated 6, 16 and 22 days after sowing for marigold, vinca and petunia, respectively.

Growth of bedding plants in six-packs. Seedlings resulting from germination experiments were transplanted into six-packs containing various CGW:UC Mix blends and transferred to a green-

Characteristics of CGW Sample

CGW Sample	EC[z]	CEC[y]	N(%)	C(%)	C/N	P(%)	K(%)	Ash(%)	Total mineral N[x] Fresh	Total mineral N[x] Aged	Mineralization index[w]	Germination index[v]
1	8.3	21.5	1.40	12.4	8.9	0.31	0.73	62.4	109	328	+5.1 (1.7)	84 (16)
2	5.8	17.3	1.23	12.5	10.2	0.29	0.67	57.8	103	18	-6.3 (1.1)	96 (16)
3	12.8	13.8	0.74	8.7	11.8	0.20	0.61	63.5	54	21	-13.6 (0.3)	55 (18)
4	11.4	18.8	1.01	11.2	11.1	0.20	0.45	73.3	343	15	-8.4 (3.2)	86 (21)

[z] Electrical conductivity, $dS \cdot m^{-1}$
[y] Cation exchange capacity, $mol(+) \cdot kg^{-1}$
[x] NH_4-N + NO_3-N, $mg \cdot kg^{-1}$
[w] Change in mineral content during 14-day incubation of a 10% CGW/soil blend relative to unamended soil; negative numbers indicate net immobilization
[v] Percent seed germination x radicle length x 100, in relation to a distilled water control

Table 1. ***Physiochemical characteristics, mineral N content, and net mineralization/immobilization behavior of the four composted green waste (CGW) samples. Mineralization index and germination index values are followed by the (standard error of the mean).***

house for subsequent growth studies. Seedlings were transplanted into the same blend used for germination. Six-packs (four/species/CGW blend) were arranged in a randomized complete-block design on the greenhouse bench at 22-30 °C and irrigated daily with a half-strength Hoagland's Solution. Each bedding plant species was grown to a marketable size in the six-pack. This took 28, 42 and 43 days for marigold, petunia and vinca, respectively. Half the plants grown in six-packs were harvested to estimate plant growth by measuring leaf area (marigold and vinca only) and top fresh and dry mass.

Growth of bedding plants in 530-mL pots. The remaining half of the plants were transplanted into 530-mL pots for subsequent growth studies. The blends used in the 530-mL pots were identical to those used in the six-packs and each plant was continued in the blend in which it had been growing. The pots were arranged in a randomized complete-block design on a greenhouse bench. Each species was grown to a marketable size. This took 21, 18, and 28 days for marigold, petunia, and vinca, respectively. All plants were harvested to estimate plant growth by counting flowers (marigold only) and obtaining leaf fresh/dry mass and flower fresh/dry mass (marigold and petunia only).

Growth of chrysanthemum. Rooted cuttings of *Dendranthema* x *grandiflorum* 'White Diamond' were planted (one cutting/pot) into 1800-mL pots containing blends of CGW samples 1 and 3 with UC Mix and grown in the greenhouse. Pots were arranged on a greenhouse bench in a randomized complete-block design. After 1 week, the plants were pinched to five nodes and black-clothed (5:00 p.m. to 8:00 a.m.) to induce flowering. After 10 weeks, all plants were harvested to estimate plant growth by measuring height and stem and flower fresh and dry mass.

Growth of woody perennials. Liners of *Pittosporum tobira* 'Wheeleri', *Photinia* x *fraseri* and *Juniperus sabina* 'Moon Glow' were transplanted into 3.8-liter containers of CGW:UC Mix blends on 14 Apr. 1994. On 17 May 1994, slow-release fertilizer (15 g, Nutricote 20-7-10, Type 180, Plantco, Inc., Brayton, Ontario, Canada) was applied as a topdress to each container. Plants were grown in an outdoor container nursery and automatically irrigated daily with tap water. Containers were arranged into two blocks with five replications per block. On 28 Nov. 1994, all plants were harvested to estimate plant growth by measuring top and root fresh and dry mass.

All data for all experiments were analyzed using the General Linear Model (GLM) Procedure of the SAS statistical system (SAS Institute, 1988).

Results and Discussion

Physiochemical characteristics. Physiochemical characteristics of CGW differed substantially among samples (Table 1). CGW samples 3 and 4 were higher in EC and percent ash, but lower in N, P and K than samples 1 and 2. Macronutrient content was lower and ash content higher than is typical of more conventional agricultural composts, reflecting the substantial quantity of organic material (bark, tree trimmings, etc.) present in the municipal green waste feedstock. The relatively high EC in all samples mandated thorough leaching (> 2X volumes of half-strength Hoagland's Solution #2) before use. Despite low C : N ratios (<12), three of four CGW samples showed net N immobilization in the controlled environment incubation; these three samples also showed a substantial decline in mineral N content during aging, and one (Sample 3) inhibited tomato germination and seedling growth in the phytotoxicity assay (Germination Index, Table 1). These were all indications of incomplete composting. However, the composting period (2-3 months) and technique (windrow, with periodic turning) was typical of CGW operations in California.

Differences also existed in air-filled porosity, water holding capacity and bulk density of the blends (Table 2). Air-filled porosity was variable, but generally low; media with AFP <10% require careful water management. CGW had similar (Sample 2) or higher bulk density and lower water holding capacity than UC Mix. CGW Sample 3 had the largest particle size (90% >0.5 mm, mass basis), while all other CGW samples and CGW : UC Mix blends had 30% or more mass in particles <0.5 mm. No media evaluated met the standard of 70% of particles in the 0.5 - 4.0 mm range.

Germination of bedding plants. Germination percentage for marigold was between 84%±9% and 98%±4% (overall mean = 90%) in all media except unamended sample 4 (53%±18%). Germination percentage for petunia was between 53%±4% and 70%±7% (overall mean = 58%) in all media except for those in the 1:0, 3:1, 1:1 (CGW:UC Mix) blends (Sample 1) and unamended samples 3 and 4. The germination percentages for those

CGW Sample	Media blend CGW : UC Mix	Air-filled porosity (%)	Water holding capacity ($mL \cdot mL^{-1}$)	Bulk density ($g \cdot mL^{-1}$)	Particle distribution (%), mass basis >4 mm	0.5-4 mm	<0.5mm
1	1:0	9.3	0.46	0.51	13	48	39
	1:1	5.0	0.55	0.47	11	42	47
2	1:0	9.9	0.51	0.39	23	45	31
	1:1	8.8	0.57	0.37	17	30	53
3	1:0	12.4	0.45	0.45	37	53	10
	1:1	7.7	0.53	0.36	20	41	38
4	1:0	3.3	0.48	0.63	13	48	39
	1:1	6.1	0.58	0.46	11	42	47
UC Mix	1:0	6.4	0.60	0.41	3	20	77

Table 2. ***Physical characteristics of composted green waste (CGW) and CGW : UC Mix blends. All samples were 5 cm deep.***

blends were 48%±4%, 38%±0%, 29%±1%, 40%±11%, and 29%±6%, respectively. Germination percentage for vinca was between 30%±16% and 60%±11% (overall mean = 40%). This is a relatively low germination response for vinca and may have been due to low viability of the seed used.

Growth of bedding plants in six-packs. Total leaf area, top fresh and dry mass for marigolds grown in six-packs containing blends of CGW Samples 1 and 2 were not significantly different from those in UC Mix. For CGW Samples 3 and 4, marigolds grown in CGW:UC Mix ratio blends > 1:1 (e.g., 3:1 and 1:0) had lower total leaf area and top fresh and dry mass. Top fresh and dry mass of petunia plants grown in six-packs containing CGW Sample 1 differed significantly in some blends. Petunias grown in un-amended CGW Sample 2 had lower top fresh and dry mass. In CGW Sample 3, petunias grown in media with 75% or more CGW had lower top fresh and dry mass, while in CGW Sample 4 those plants grown in 50% or more CGW had lower top fresh and dry mass. Total leaf area, top fresh and dry mass of vinca plants grown in six-packs containing CGW Sample 1 were not significantly different in any blends. Vinca grown in unamended CGW Sample 2 had lower total leaf area and top fresh mass. In CGW Samples 3 and 4, vincas grown in CGW:UC Mix ratio blends greater than 1:1 had lower total leaf area, top fresh mass and dry mass.

Growth of bedding plants in 530-mL pots. Leaf fresh and dry mass of marigolds grown in 530-mL pots containing CGW Sample 1 differed significantly in some blends. In CGW Samples 2, 3 and 4, marigolds showed reduced growth in blends > 3:1, 1:1 and 3:1, respectively. Leaf fresh and dry mass and flower dry mass of petunias grown in 530-mL pots containing CGW Sample 1 were similar in all blends. In CGW Samples 2, 3 and 4, petunias showed reduced leaf fresh and dry mass in blends > 3:1. Flower dry mass was reduced only in the unamended Sample 4. The leaf fresh and dry mass of vincas grown in 530-mL pots were reduced in blends greater than 3:1, 3:1, 1:1, and 3:1 for Samples 1, 2, 3 and 4, respectively.

Growth of chrysanthemum in 1800-mL pots. The height and stem and flower fresh and dry mass of chrysanthemums irrigated daily with half-strength Hoagland's Solution and grown in 1800-mL pots containing CGW Samples 1 and 3 were less in blends > 1:1. Overall, chrysanthemums grown in CGW Sample 1 were taller and had higher stem and flower FM and DM.

Growth of woody perennials. There were no differences in top and root fresh and dry mass for all three woody ornamentals, *Juniperus*, *Photinia* and *Pittosporum*, grown in blends of CGW Sample 1 and UC Mix. Total dry mass for all five blends ranged from 31.1 to 39, 21.9 to 43.5 and 14.1 to 23.6 g for *Juniperus*, *Photinia* and *Pittosporum*, respectively.

Conclusions

Unblended CGW, regardless of sample, was not consistently equivalent to UC Mix in terms of overall plant growth; in some cases growth was drastically reduced in unblended CGW. If CGWs are to be used as a container medium, they will have to be blended with some other material to minimize inherent deficiencies (water holding capacity, porosity or other characteristics) and variability among sources. As a group, germinating seeds of all three bedding plant species were most adversely affected by the CGW:UC Mix blends while the woody plants were the least affected. In general, larger plants (liners, rooted chrysanthemum cuttings, bedding plants grown in six packs) were best able to grow in media with high CGW content.

The poor overall performance of Samples 3 and 4 was likely due, in part, to incomplete composting. Compost maturity is an important characteristic of CGW. Lack of compost maturity of CGW Samples 3 and 4 was suggested by decreased mineral N during aging and negative Mineralization Indices. Differences in the ECs among the four samples was not a factor, given the amount of leaching done before their use.

Despite the heterogeneity of the CGW samples, their use as an amendment (25% - 50%, by volume) is very promising. There was no evidence of pathogen problems and the work of others strongly suggests that CGW may suppress common root pathogens. Viable weed seeds were present in all CGW samples, but at very low populations. The cost of producing CGW is subsidized by tipping fees paid by the generators of the waste, so the finished CGW will be very cost effective. It is generated in urban areas, relatively near nurseries, so transport costs will also be less than for peat moss and timber by-products (e.g., bark). Currently, peat moss, at $88.00/m^3, is more than four times the cost of CGW. At $20/m^3, CGW could be a lower-cost alternative to peat or bark products routinely used in container media.

This study is published in its entirety in HortScience, Vol. 32 (1), February, 1997. *For reprints, contact David Burger at: dwburger@ucdavis.edu.*

Literature Cited

Hoagland, D.R. and D.I. Arnon, 1950. *The water-culture method for growing plants without soil.* California Agr. Expt. Sta. Circ. 347.

SAS Institute, 1988. *SAS/STAT user's guide, release 6.03* ed. SAS Inst., Cary, N.C.

Statutes of California and Digests of Measures, 1989. Public Resources Code, Section 40052.

News From the Ex(tension) Files

By Linda Dodge

Mr. B. D. of Rancho Cordova writes:

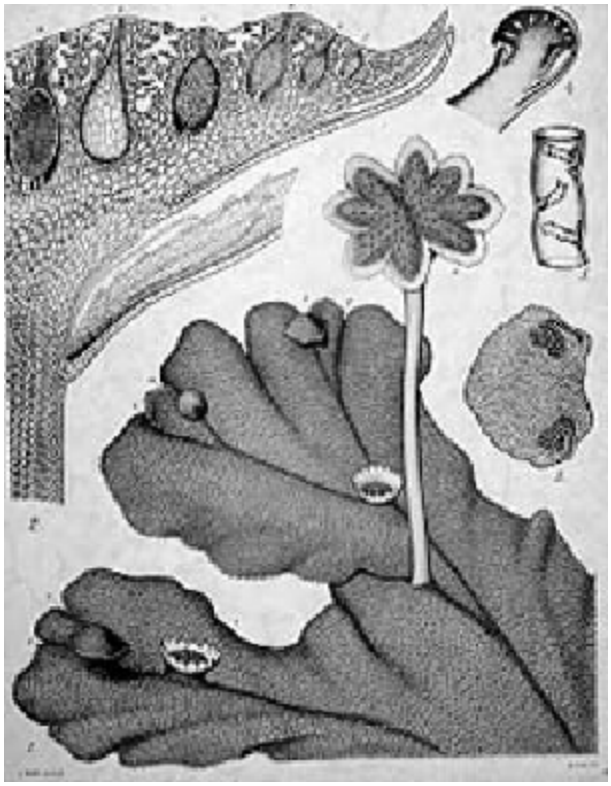
My roses are just about to put out the first blooms of the spring. Unfortunately, several of the buds are drooping as if wilted from lack of water. I know the plants have enough moisture so what could be the problem?

"Flagging" or drooping of young rose shoots in the spring despite adequate moisture is not an uncommon sight. It is usually evidence of the presence of certain insect larvae in the stem. The raspberry horntail is a wasp that lays its eggs just under the bark of rose stems. The larvae that hatch feed on the stem tissue, damaging the water-conducting cells. The result is wilting of the shoot tips and loss of the season's first blooms. There are also several types of stem borers that attack roses including the Pacific flatheaded borer and flatheaded appletree borer. These insects are beetles as adults and lay eggs on stem surfaces that hatch to form flatheaded larvae. The larvae bore into stems and feed on tissues cutting off the water supply to the shoot tips.

The only effective control for these insects is removal and destruction of infested stems. The wilting shoots should be pruned out below any noticeable holes or swelling that would indicate the presence of larvae.

Ms. S. T. phoned the department with this query:

I was recently given a lovely heather plant and have displayed it in my kitchen window for several weeks. The surface of the soil in the container is now covered with green strap-like leaves that have little palm trees growing out of them. Does anyone know what this is?



What you have in your pot of heather is called a liverwort, a very primitive plant related to mosses. Although it is considered a troublesome weed of container plants in nurseries, it is considered one of the most ancient forms of plant life and a delightful curiosity by botanists and certain research associates. The green ribbon-like body or thallus of the plant grows in very moist, shady conditions (a pot of heather is perfect) and produces primitive roots called rhizoids on the underside for water and nutrient absorption. The thallus continues growing and occasionally branches, forming a flat mat on the soil surface. If a piece is broken off it can resume growth and form a new plant under the right conditions. Small cups on the upper surface produce special asexual reproductive structures that can establish new plants if dislodged from the cup by splashing water. The structures that look like small palm trees are actually the sexual reproductive parts and occur on separate male and female plants. Don't ask me how they get together but it requires lots of water. In any case, you have the option of removing the liverwort from your heather plant, but there are those among us who would be more inclined to neglect the heather and cultivate the lowly liverwort.

News from the Department Chair

This issue of Growing Points will be the last one created by Susan Imboden. Susan assumed responsibility for writing, editing, publishing and distributing Growing Points in 1997. Under her watchful eye and professional touch Growing Points grew (pun intended) into a model publication focused on sharing campus-based information with our important friends and alumni. She also put Growing Points onto a regular schedule whereby you could expect an issue four times each year. Susan has moved on to bigger and better professional opportunities and we wish her well. Thanks Susan!!

Composting With Worms

Information for this article was obtained from brochures produced by the Alameda County Waste Management Authority & Source Reduction and Recycling Board. The Authority teaches home composting to residents of Alameda County. Visit their website at: www.stopwaste.org

Getting Started

Choose a bin.
Buy a bin, or build one out of wood, plastic, an old dresser drawer, shipping crate, or barrel.

What kind of bin?
Your bin needs to be 10"-16" deep, have a snug-fitting lid, and holes in the bottom or sides for ventilation. To keep rodents out, the holes need to be 1/4" or smaller. The rule of thumb for bin size is two square feet of surface area per person. An average two-person house would need a bin about 2'x2' = 4 square feet, or two bins that are 1'x2' = 2 square feet each.

Pick a place.
Locate your bin where it will not freeze or overheat--in a pantry, kitchen corner, laundry room, garage, basement, patio, deck, or in your garden.

Make a worm bed.
Worms like to live under lots of moist paper or leaves. This helps keep them cool and moist, gives them fiber to eat, and prevents fruit flies from getting to the food. To make your worm bed, tear black and white newspapers into one-inch strips, fluff them up, then moisten them so they are as damp as a wrung-out sponge. Fill your bin 3/4 full with this moist "bedding." Shredded, corrugated cardboard, leaves, compost, sawdust and straw can also be added in as bedding. Sprinkle bedding with a few handfuls of soil. Do not use glossy paper or magazines.

Adopt some worms.
Compost worms are often called "red worms" or "red wigglers." They are different from earthworms and nightcrawlers who live underground. You can find red worms in an old compost pile, get them from a friend's worm bin, or check with your local UC Extension office to locate a source in your area.

Feed worms their first meal.
Start your worms off with about a quart of fruit and vegetable trimmings (see "Do's and Don'ts" section). Then leave them alone for a couple of weeks while they get used to their new home.

Worm Bin Troubleshooting

Problems	Causes	Solutions
Worms are dying	Food and bedding all eaten	Harvest compost, add fresh bedding and food
	Too dry	Add water until slightly damp
	Extreme temperatures	Move bin so temp. is between 40-80 degrees F
Bin attracts flies and/or smells bad	Food exposed/overfeeding	Add 4"-6" layer of bedding and stop feeding for 2-3 weeks
	Non-compostables present	Remove meat, pet feces, etc.
Sowbugs, beetles in bin	These are good for your worm compost!	

Maintaining Your Worm Bin

Feed your worms about a quart (one pound) of food scraps per square foot of surface area in your bin per week. To avoid fruit flies and odors, always bury food under the bedding. Don't dump and run!

Add fresh bedding every 1-3 months. Always keep a 4" to 6" layer of fresh bedding over the worms and food in your bin.

Keep bedding as moist as a wrung-out sponge. In a plastic bin, add dry bedding to absorb excess moisture. Wooden bins may require adding water occasionally.

Compost Do's and Don'ts

Do Compost:
- all fruit and vegetable trimmings
- coffee grounds and filters
- tea bags
- citrus rinds
- rinsed-out, crushed eggshells
- used paper towels
- soft green plant trimmings

Don't Compost:
- meat, bones and fish
- dairy products and grease
- grains, beans and breads
- dog, cat and bird feces
- sawdust from plywood or treated wood
- woody prunings (in closed-air systems, worm bins, or under ground)

UC Davis Program Teaches Kids About Composting

Each spring, the UCD Children's Garden Program (CGP) hosts 2,000 children, teachers and parents on field trips to the Plant Science Teaching Center and Student Farm. Started in 1985 by a student who wanted to work with children in a garden setting, the site consists of about ¾ acre of annual beds, mixed fruit trees, culinary and medicinal herbs, native perennials, plants attractive to beneficial insects and hummingbirds, and other ornamentals. According to CGP program director Carol Hillhouse, the farm staff has recently obtained a grant from the Slosson Research Endowment Fund to improve the garden and develop additional educational materials for the program.

Several horticulturists contribute expertise to this project. Cynthia Havstad, coordinator of the Alameda County Master Composter Program tends compost bins two days a week at the farm where she is school gardens project coordinator. Recently, I watched her dump discarded bits of onion, cabbage, celery, tomatoes and eggshell into the worm bin as she explained what is known as *vermicomposting*—the feeding of kitchen waste to worms to produce a nutrient-rich soil amendment.

"Recycling with worms is easy, even for people who don't do a lot of gardening," explained Cynthia, "because everyone has kitchen waste." The ability to recycle kitchen waste, which comprises 10 percent of municipal solid waste, is an important part of reducing landfill volume.

Vermicomposting is one of two kinds of composting practiced at the farm where staff and students also recycle vegetative garden waste in garden- and farm-scale systems. These three systems demonstrate the recycling of nutrients and provide an opportunity for hands-on learning about how to compost. - *Susan Imboden*

Cynthia Havstad, school garden project coordinator, distributes kitchen waste in the UCD Student Farm worm bin (above). The farm obtains pre-consumption waste materials from the campus coffeehouse. "Red wrigglers" (left) reproduce at a rapid rate. It is estimated that, under the right conditions, the number of worms in a vermicomposting bin will increase from eight to 1,500 over a six-month period.

Harvesting and Using Worm Compost

Harvest worm compost at least once each year to keep your worms healthy. You can start harvesting 2-3 months after you set up your bin. Simply reach in and scoop out the brown crumbly compost, worms and all. You can also move the contents of your bin to one side, place fresh bedding and a handful of soil in the empty space and bury food there for a month or two. Harvest the other side after the worms have migrated to the new food and bedding.

Using worm compost will help your plants thrive by adding nutrients and humus to the soil. Sprinkle a 1/4" to 1" layer at the base of indoor or outdoor plants, or blend no more than 20% worm compost into potting mix or garden soil.

For More Information:

Backyard Composting, 1992, Harmonius Technologies, Harmonius Press, Ojai, CA 96 pp.

Rodale Book of Composting, 1992, G. Gershuny, St. Martin's Press, New York, NY, 278 pp.

Worms Eat My Garbage, 1982, Mary Appelhof, Flower Press, Kalamazoo, MI, 100 pp.

Reader Survey

The Growing Points articles I have found most useful are: _____

_____

_____

_____

_____.

I would like to read more about: _____

_____

_____

_____

_____.

Address Error?

Due to a corruption in our mailing list, some copies of the Winter issue were incorrectly addressed. We hope that we have found and corrected all of the errors and thank those of you who have already contacted us about the problem.

Please check your name and address below and let us know if there are corrections we have missed.

Thanks also to those of you who responded to the Reader Survey in the Winter issue. For those who may not have received the issue, we have included it again here for your use.

Subscription Information

Anyone wishing to receive Growing Points may be placed on the mailing list by calling (530) 752-0130. There is no subscription charge.

Growing Points Editor
Environmental Horticulture Dept., University of California, One Shields Ave., Davis 95616-8587
Phone: 530-752-0130; Fax: 530-752-1819

Cooperative Extension
U.S. Department of Agriculture
University of California
Oakland, CA 94612-3560

Mail ID: 6556
Official Business
Penalty for Private Use: $300

An Equal Opportunity Employer