The uniform tree structure also contributes to decreased pruning costs by reducing the amount of time a pruner spends deciding which cuts to make on a particular tree. Once the two scaffolds have been selected, they are not permitted to branch. The pruner then needs only to regulate the amount of fruiting wood rather than develop additional structural components of the tree.

When pruning mature KAC-V peach and nectarine trees, we recommend using a system of renewal pruning in which the previous season's fruiting shoots (hangers) are cut back to the main scaffold as closely as possible and "replaced" with new fruiting wood arising from as close to the main scaffold as possible. In this type of pruning, the highest-quality fruiting wood (20 to 50 cm long and 3 to 6 mm in diameter) is selected for fruit production in the upcoming season and new fruiting wood is stimulated for the following year. This also helps to keep the in-row space between trees open to direct light exposure.

Tree support

With heavy cropping on late-maturing cultivars, it may be advantageous to prevent excessive spreading of the scaffolds by looping tree rope around the two scaffolds at about three-fourths the height of the tree. Because the scaffolds are unbranched, they tend to be much stronger than in a standard open-vase tree and one tree rope is adequate. Only rarely are additional supports, such as tree props, needed.

Crop-load management. Because of the uniform tree structure, fruit load can be estimated and regulated relatively easily. Because the tree consists of two very similar scaffolds with fruiting shoots coming directly off of them, each tree can be pruned accurately to have a specific number of fruiting shoots, and later the fruit on

each shoot can be thinned to a specific fruit load. For instance, if a grower expects to have a yield of 3000 boxes (10 kg/box) per hectare and has 1000 trees per hectare, then three boxes are needed per tree. If the average fruit weight is 175 g (equivalent to size 50 to 56), then about 200 fruit (100 fruit per scaffold) are needed per tree (assuming 25% cullage). If, on average, the grower believes that four fruit can be carried per shoot given their average length, then each tree will need about 25 shoots per scaffold assuming no significant loss of shoots or fruit buds to freezing or spring frost damage. At thinning time, the grower can instruct the thinning crew to leave about four fruit per fruiting shoot. At harvest, the grower can note if fruit size is smaller or larger than expected and unless there is some environmental explanation for a deviation from expected production (such as drought or excessive heat), the grower can adjust the pruning and thinning practices during the next year.

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Evaluation of Products to Enhance Tree Stump Decay

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Additional index words. potassium nitrate, stump removal

Summary. Three commercially available tree stump removal products: Dexol Stump Remover, Cooke Stump Remover & Potassium Nitrate, and Lily/Miller Stump Remover and Potassium Nitrate, as well as three nitrogen-containing fertilizers—potassium nitrate (13-0-45), ammonium nitrate (34-0-0), and ammonium sulfate (21-0-0), were evaluated for their ability to hasten decomposition of the stumps of two tree species [*Eucalyptus camaldulensis* Dehnh. and *Paulownia tomentosa* (Thunb.) Steud.]. None of the products accelerated decay in either species after 8 weeks.

Various tree stump removal products on the market claim that they stimulate the decomposition and decay of tree stumps. The primary ingredient in these products is potassium nitrate. Rockwell (1944) recommended using potassium nitrate on stumps "to make them rot quicker." Metcalf (1944), however, disagreed, stating that no chemicals available at a reasonable cost could quickly accelerate decomposition of tree stumps.

The original purpose of adding potassium nitrate was to facilitate burning of the stump, as indicated on labels of commercial products containing potassium nitrate (Wray, 1992). A review of published literature found no scientific studies related to chemical enhancement of tree stump decay.

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Table 1. Density comparisons among stump treatments, 8 weeks after product application.

Treatment	Product applied (g/hole)	Mean density ² (g·cm ⁻³)	
		Eucalyptus	Paulownia
Dexol Stump Remover ^y	50	0.29	0.21
Cook Stump Remover and Potassium Nitrate ^x	40	0.33	0.23
Lily/Miller Stump Remover and Potassium Nitrate ^w	40	0.32	0.21
Potassium nitrate (13-0-45)	45	0.33	0.21
Ammonium nitrate (34-0-0)	50	0.32	0.22
Ammonium sulfate (21-0-0)	35	0.34	0.23
Control—no hole, no product		0.38	0.21
Control—holes drilled, water only		0.35	0.22

²Means within columns not significantly different by Duncan's multiple range test, $P \leq 0.01$.

^yDexol Industries, Torrance, Calif.

^xCooke Laboratory Products, Portland, Ore.

^wThe Chas. H. Lilly Co., Portland, Ore.

To test the product label claims and evaluate possible lower-cost alternatives, the effect on stump decomposition of three commercially available stump remove products, all containing potassium nitrate, were compared. No additional product contents were listed on any of the labels. In addition, three nitrogen-containing fertilizers—potassium nitrate, ammonium nitrate, and ammonium sulfate—were tested.

Methods

All labels recommended drilling 2.5-cm (1-inch-) diameter holes into the top of stumps, packing the holes with product, and applying hot water into the holes. Eight treatments, four replicates (tree stumps) each, were applied in Feb. 1994 to two tree species: *Eucalyptus camaldulensis* Dehnh. (red gum) and *Paulownia tomentosa* (Thunb.) Steud. (empress tree) (Table 1). All trees were ≈ 6 years old, averaged 15 cm in diameter at breast height, and were stumped to 0.5 m above ground level. One control treatment included no holes and no product application. Another control set of trees had holes drilled, but only hot water added. Holes were made near the center of the stump and were 2.5 cm in diameter and 15 cm deep, giving a volume of 74 cm³. Twenty milliliters of hot water, $\approx 40^\circ\text{C}$ (104F), was applied to each hole after adding the test product. The hot water application, at the same temperature as before, was repeated after 2 h, as per label directions. Total rainfall at the test site during the study period was 5.3 cm (2.1 inches).

Evaluation

Eight weeks after the treatment applications, decomposition of the tree stumps was evaluated. This timing was

based on a label statement that the product treatments should be allowed to stand from 4 to 6 weeks. A new 2.5-cm hole, 15 cm deep but 2.5 cm away from the treated hole, was cut and the core material was collected. The evaluation hole for the previously untreated stump (control) was drilled at the same relative location as the treated stumps. The core material was dried in a forced-air oven at 50°C for 24 h and weighed. Because any decomposition would reduce wood density, comparisons among treatments were made to determine the efficacy of the treatments (Zabel and Morrell, 1992). After this evaluation, each stump was recut 15 cm from the top to observe potential decay in the area near the bottom of the original treatment holes.

Results and discussion

No significant differences in decomposition were observed among any of the treatments (Table 1). No decay or discoloration was seen in the visual evaluation of the recut stumps. Because the products did not increase the rate of decomposition, and burning is not allowed in many areas of the United States, the continued use of potassium nitrate-containing products for this purpose is questioned.

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A Window Into Below-ground Growth of Landscape Trees: Implications for Transplant Success

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Additional index words. rhizotron, root growth, *Fraxinus pennsylvanica* Marsh., *Quercus coccinea* Muenchh., *Corylus colurna* L., *Syringa reticulata* (Blume) Hara

Summary. Root and shoot phenology were observed, and root length within rootballs were calculated for *Fraxinus pennsylvanica* Marsh. (green ash), *Quercus coccinea* Muenchh. (scarlet oak), *Corylus colurna* L. (Turkish hazelnut), and *Syringa reticulata* (Blume) Hara 'Ivory Silk' (tree lilac) trees established in a rhizotron. Easy-to-transplant species (green ash and tree lilac) had more root length within rootballs than difficult-to-transplant species (Turkish hazelnut and scarlet oak). Shoot growth began before root growth on all species except scarlet oak, which began root and shoot growth simultaneously. Fall root growth ceased for all species just after leaf drop. Implications for tree transplanting are discussed.

The below-ground growth of landscape trees is of interest to nursery operators and landscape contractors because knowledge of root activity enhances evaluation of transplant methodology. Inaccessibility of roots of large trees hinders the

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