

transplanting. Root restriction, however, appears to be the most critical factor in affecting transplant growth in 6-packs.

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Commercial Micropropagation Laboratories in the United States

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To determine the current status of commercial micropropagation in the U.S., an extensive survey of laboratories was made in March and April, 1996, by doing telephone interviews with the manager or owner of each laboratory. All laboratories contacted and currently doing commercial production provided data.

Commercial micropropagation laboratories are located in at least 26 states and most are situated near important production areas of the horticultural industries that they service. Florida leads in plants produced, followed by California, Washington, and Oregon. California and Florida each have more than 15 laboratories; all other states have fewer than 10 each. Within states, the laboratories are often clustered in certain areas. In Florida, the heaviest concentration is near Apopka, where much of the foliage plant production is located. California labs are clustered mainly in coastal areas near San Francisco, Los Angeles, and San Diego. The Pacific Northwest labs of Washington and Oregon are located west of the Cascade Range stretching from near the Canadian border to the south of Portland.

Production of individual laboratories varies from a few thousand to tens of millions of plants per year. Small laboratories (<500,000 units per year) account for about 60% of the slightly more than 110 laboratories identified; 24 of these small labs produce only 50,000 units per year or fewer. About 30% are medium-size laboratories (500,000-2,500,000 units per year); large laboratories (2,500,000-6,000,000 units) and very large laboratories (> 6,000,000 per year) account for the remaining 10%.

Total production of micropropagated plants is now more than 120 million plants per year, considerably higher than earlier estimates of 61 to 75 million plants (Hartman, 1995; Jones, 1985; Zimmerman and Jones 1991), but a much broader range of crops is now being micropropagated than 5 to 10 years ago. Also, more laboratories were identified and contacted to obtain the figures reported here. Plants now being micropropagated can be grouped according to their uses or area of horticulture as shown in Table 1.

Foliage plants, the largest category, have as the main crops ferns, *Spathiphyllum*, *Syngonium*, *Dieffenbachia*, *Ficus*, *Calathea*, and *Philodendron*. Orchids are about

Table 1. Production of micropropagated plants in the United States by geographic region and type of crop. Numbers are thousands of plants.

Crops	Eastern U.S. ¹	Florida	West Central	Pacific Northwest	California & Hawaii	Total
Foliage plants	1200	47,975	0	0	14,520	63,695
GH flowers	278	5,178	495	0	5,346	11,297
Perennials	4,388	1,030	1,320	2,080	630	9,448
Trees and shrubs	1,434	2,480	1,400	7,850	2,130	15,294
Vegetables	3,692	0	4,849	1,130	3,191	12,862
Fruits	1431	10	50	1,970	260	3,721
Miscellaneous	25	975	1,715	1,270	560	4,545
Total	12,448	57,648	9,829	14,300	26,637	120,862

¹ Eastern U.S.—states east of the Mississippi River; West Central U.S.—states west of the Mississippi River except for Pacific coastal states; Pacific Northwest—Washington and Oregon.

one-third of the greenhouse flower crop production and other major crops are *Gerbera*, *Anthurium*, and bromeliads. Herbaceous perennials are a rapidly increasing segment of the production; major genera are *Hosta*, *Hemerocallis*, *Stokesia*, *Gypsophila*, *Heuchera*, *Leucanthemum*, and *Rudbeckia*.

Ericaceous plants (*Rhododendron*, *Kalmia*, *Pieris*, *Leucothoe*) account for more than 23 % of the trees and shrubs now micropropagated; another 22% are trees including *Acer*, *Amelanchier*, *Betula*, *Eucalyptus*, *Magnolia*, *Malus*, *Populus*, *Prunus*, and *Ulmus*. Shrubs include *Nandina*, *Syringa*, *Fothergilla*, *Hydrangea*, *Photinia*, and *Viburnum*, among others.

Potatoes are about 90% of the micropropagated vegetable crops with other crops including asparagus, garlic, and sweet potato. Fruit crops are primarily blueberry (*Vaccinium*) and raspberry (*Rubus*) with limited production of fruit tree rootstocks. Miscellaneous crops are a wide assortment of ornamental and tropical fruit crops and specialty crops including *Lilium*, *Gladiolus*, banana (*Musa*), *Citrus* rootstock, peppermint (*Mentha x piperita*), spearmint (*M. spicata*), wasabi (*Wasabia japonica*, Japanese horseradish), and sugarcane (*Saccharum officinarum*).

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