Developing a modified hydroponic stock plant system for redbud©

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INTRODUCTION

Cutting propagation is a major propagation method for the nursery industry, but there is very little stock plant management compared with the floriculture and forestry industries. Stock management of tropical annuals for cutting production has become a very specialized practice with most production occurring outside the U.S. Its stock plant management is characterized by starting with initially clean disease-free clonal material that is produced in containers under strict nutritional management. For woody plants, a selected number of deciduous forestry trees have been clonally propagated by selecting juvenile starting material for stock plants and then managing stock plants using a modified hydroponic system to optimize stock plant nutrition. The forestry industry has moved into commercial clonal production for a number of difficult-to-root crop species including *Eucalyptus* and some conifers (Assis, 2011; Chinnaraj and Malimuthu, 2011). The industry has been very successful with this approach, propagating large quantities of rooted cuttings for planting-out each year. There are three basic stock plant management principles that have allowed for consistent (>90%) cutting success. These include initial selection of juvenile material (stump sprouts, lignotubers or tissue culture), managed stock plant nutrition using a modified hydroponic system, and consistent, timely removal of cuttings to keep cutting wood from maturing. This procedure has been termed "minicuttings" and they result in vigorous rooted cuttings that have better root systems compared to traditional cuttings (Cliffe, 2010). These stock plants produce vigorous managed shoot growth that yields cuttings that consistently root when taken as minicuttings.

The objective of this research was to develop a modified hydroponic system for minicutting production using eastern redbud as a model system. Eastern redbud makes a good model system because in addition to juvenile seedlings, eastern redbud cultivars available from tissue culture present a good juvenile stage starting material for a minicutting stock plant program. In addition, although eastern redbud is difficult-to-root from cuttings, it does show rooting potential during a brief window of time during the growing season.

METHODS AND MATERIALS

Plant material

Juvenile eastern redbud (*Cercis canadensis*) plants were raised as seedlings. Mature clones were established as hedged stock blocks at the University of Kentucky research station.

Stock plant production system

Stock plant production systems were established for minicutting production in sand beds and coir bags. Each was irrigated with a modified hydroponic nutrient solution using an automated timing system. Initial experiments compared full-strength with half-strength nutrient solution for stock plant growth. In addition, clonal plants purchased as grafted material were established in hedged stock blocks in field beds. Stock plants were pruned every 3 weeks to three nodes.

Cutting propagation

Terminal cuttings were rooted under mist. Cuttings were treated with IBA concentrations ranging from 0 to 15,000 ppm as a quick dip. Cuttings were evaluated for

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time to first root emergence, rooting percentage, number of roots per cutting.

RESULTS AND DISCUSSION

Stock plants grow vigorously in the modified hydroponic sand beds (Figure 1). It was determined that plants responded equally well when irrigated at full or half-strength nutrient solutions (Figure 2). Subsequently, all sand beds were moved to half-strength fertilizer solutions. Stock plants in sand beds have gone through four rounds of pruning and it appears that cuttings will be available every 2 to 3 weeks.

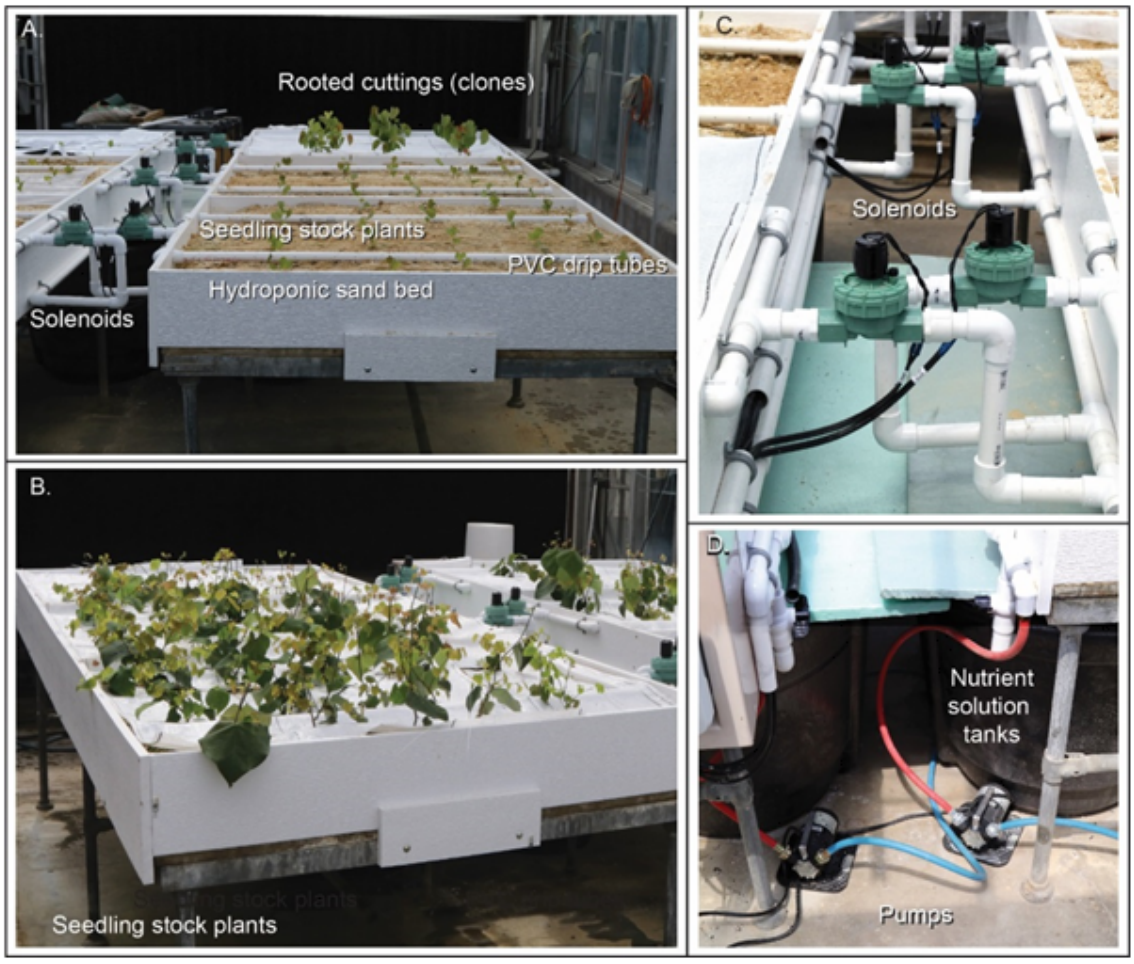

Figure 1. Sand bed production of stock plants. A. Sand bed. B. Stock plants after several rounds of hedging. C and D. System for pumping nutrient solution to sand beds.

A preliminary dose response to auxin using seedlings or clonal cuttings from hedged stock plants indicated that cuttings responded to 10,000 and 15,000 ppm auxin as a quick dip. Rooting was very similar for cuttings taken from greenhouse and field-grown stock plants (Figure 3). Seedling and rootstock cuttings were easier to root compared to cuttings from clonal plants. The highest rooting for clones was below 30%. Also, 'Oklahoma' cuttings consistently rooted at lower percentages than 'Appalachian Red'.

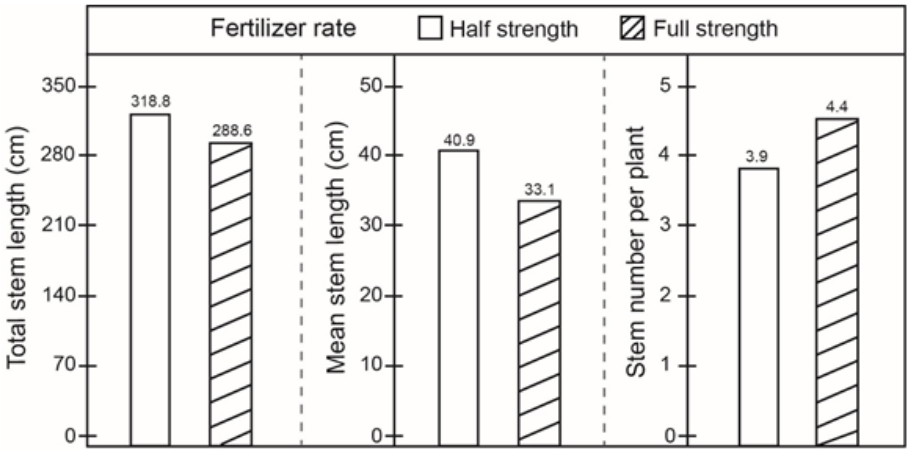

Figure 2. Impact on nutrient solution rate on greenhouse-grown stock plant development.

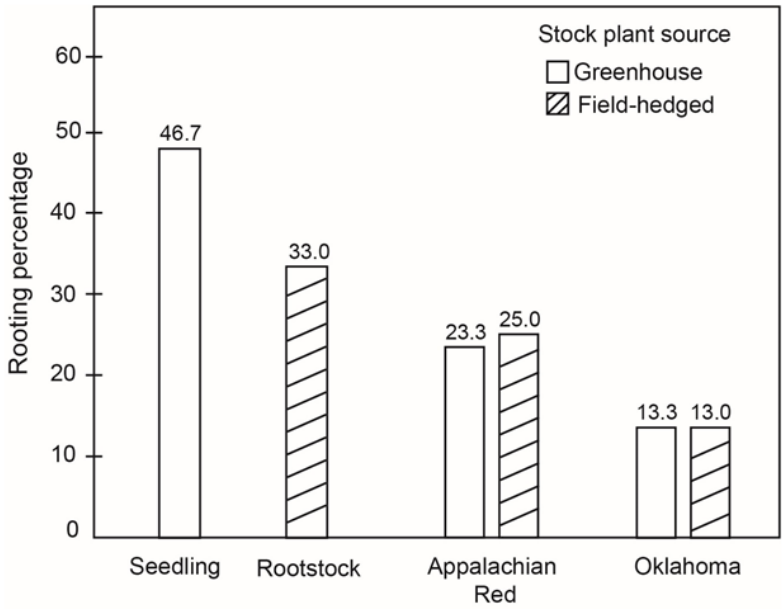

Figure 3. Rooting percentages for seedling and clonal redbud cuttings taken greenhouse or field-managed stock plant plants.

ACKNOWLEGEMENTS

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