Auxin, Bottom Heat, and Time of Propagation Affect the Adventitious Rooting of *Leucophyllum candidum* 'Silver Cloud'®

Jack J. Kelly
University of Arizona, Pima County Cooperative Extension, 4210 N. Campbell Ave., Tucson, Arizona 85719

INTRODUCTION

Leucophyllum candidum 'Silver Cloud' is a woody shrub in the Scrophulariaceae (figwort) family and is grown as an ornamental in the desert regions of the Southwestern U.S. and throughout the world in areas with similar climates. Given its popularity and ability to thrive under low-water regimes, it has become a popular part of many plant palettes. The plant is propagated from softwood cuttings to maintain the clonal integrity of the species. *Leucophyllum candidum* 'Silver Cloud' is considered an elite clone of the plant and can be recalcitrant to rooting. Rooting percentages below 50% for this clone are not uncommon in commercial nurseries. Information on asexual propagation of *Leucophyllum* species is scarce. Nutritional status of stock plants is important, as rooting of cuttings was enhanced by maintaining the leaf tissue of stock plants at a level of >2% nitrogen (Simpson and Hipp, 1982). The objectives of the study presented here were to investigate the influence of the potassium salt of indole-butyric acid (K-IBA), the use of bottom heat, and the month of propagation on rooting of *L. candidum* 'Silver Cloud'.

MATERIALS AND METHODS

Stock plants of *L. candidum* 'Silver Cloud' were conditioned with a weekly feeding of 200 ppm N applied as a modified Hoagland's Solution to maintain 2% N in the plant tissue. Stock plants were pruned back to force new growth 72 days prior to taking cuttings in June and 30 days prior to taking the cuttings in July and August. All cuttings were removed, washed in clean water, trimmed to remove basal leaves and the terminal bud, and cut to a length of 10 cm. The potassium salt of IBA was applied to the base of cuttings at 0, 2500, 5000, 7500, or 10000 $mg \cdot L^{-1}$ as a 5-sec dip. Cuttings were stuck in 100% coarse perlite and given intermittent mist. Half of the cuttings were grown on bottom heat at 30 °C and the other half without bottom heat at 22–30 °C. The experiment was repeated in June, July, and August. After 30 days all cuttings were removed and rooting percentage and root numbers were determined.

RESULTS AND DISCUSSION

The formation of adventitious roots and root number were enhanced by the application of auxin, bottom heat, and varied by month of propagation. Statistical analyses indicated that there was a significant three-way interaction between, auxin, month of propagation, and bottom heat. Rooting of 80% to 100% was achieved during all months with bottom heat and auxin at 2500, 5000, or 7500 $mg \cdot L^{-1}$. Without bottom heat in June and July higher auxin levels were required to obtain >80% rooting. Highest root numbers were formed in July with bottom heat and auxin at 2500 or

5000 mg·L^{-1}. In August, rooting of >80% and highest root number resulted when cuttings were kept without bottom heat, regardless of auxin level.

After the conclusion of this study, an informal experiment was conducted in a commercial nursery in Tucson, Arizona. Cuttings of *L. candidum* 'Silver Cloud' were taken as described above during the month of October and basal ends were dipped in 2500 mg·L^{-1} K-IBA. Bottom heat of 27 ºC was provided and plants were kept under intermittent mist. After 21 days, rooting percentage of 75% was achieved, while previous propagation of *L. candidum* 'Silver Cloud' in this nursery yielded rooting percentages of less than 20%.

CONCLUSIONS

Leucophyllum candidum 'Silver Cloud', when propagated in June, should be supplied with bottom heat (25–30 ºC) and auxin at 7500 mg·L^{-1}. Later in summer when temperatures are higher, supplemental bottom heat is no longer critical, but auxin at 2500 mg·L^{-1} or higher still enhances rooting percentage and root numbers.

LITERATURE CITED

Simpson, B.J. and **B.W. Hipp**. 1982. Influence of nitrogen on the rooting of *Leucophyllum candidum* cuttings. Plant Prop. 27(4):10-11.

Actinorhizae and *Ceanothus* Growing®

Shengjun Lu
Bitterroot Restoration, 55 Sierra College Blvd., Lincoln, California 95648

INTRODUCTION

Plants in the genus *Ceanothus* grow in rocky and sandy areas. Because of their nitrogen-fixing ability and also because they are pioneer species, *Ceanothus* plants are extremely important in dryland ecological restoration.

Ceanothus plants form symbioses with bacteria in the genus *Frankia*. The actinomycetes nodulate eight plant families representing about 25 genera, collectively called actinorhizal plants (Baker and Schwintzer, 1990). Actinomycetes possess fungal-like structures, including septate filamentous hyphae, vesicles, sporangia, and spores. The bacteria invade root hair cells by the formation of an infection thread (Berg, 1999). Actinorhizae provide plants a ready supply of nitrogen, water, and nutrients, as well as elevated disease resistance.

In nursery conditions, plants in the genus *Alnus* form actinorhizae with air-borne inocula. However, *Ceanothus* plants do not form actinorhizae even though native stands exist in adjacent forests.

The goal of our experiments was to synthesize actinorhizae for *Ceanothus* plants under nursery conditions. We first conducted a literature search, then interviewed researchers, and conducted two greenhouse experiments.

Literature Search and Interviews. We found from the literature search that the genus, *Frankia*, was responsible for the symbiotic relationship. These actinomycetes infect plant roots primarily by root-hair infection. Actinomycetes form vesicles and spores as storage and inoculation organs (Verghese and Misra, 2002; Maunuksela, 2001), and actinomycetes exist in nonhost plant stands or long after host plants have disappeared from a site (Jeong and Myrold, 2001). However, there are few publications focused on how to synthesize actinorhizae in a commercial nursery.