Cutting Propagation of *Juniperus osteosperma* (Utah Juniper)©

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INTRODUCTION

As a drought tolerant plant, *Juniperus osteosperma*, Utah juniper, has potential for use in water-conserving landscapes. Certain specimens of Utah junipers found in the wild have unique phenotypes that make them attractive options for landscape design. Such phenotypic characteristics can only be perpetuated through asexual propagation techniques, such as cutting propagation. Unfortunately, Utah juniper, like other upright juniper species, is not easily propagated vegetatively. To our knowledge Reinsvold (1986) is the only published record of Utah juniper being propagated by cuttings; unfortunately, the focus of the study was not cutting propagation of Utah juniper and so insufficient data were included for replicating the study. The purpose of this research was to develop a propagation protocol for Utah juniper.

MATERIALS AND METHODS

Terminal cuttings were collected from 15 wild Utah junipers in Park Valley, Utah (UT) on 16 Nov 2010 and 19 Nov 2011. The cuttings were taken only from apparently juvenile plants that were characterized as possessing no strobili (cones) and having predominately awn-like leaves. Both years, the same GPS-marked trees were used as stock plants in order to maintain uniformity in plant material across years. After harvesting, the cuttings were placed in moist plastic bags and stored in a cooler with ice for transporting back to the greenhouse in Logan, Utah. They were then stored overnight at 4°C and processed the following day. Cuttings from all stock plants were pooled, cleaned, and 288 of the most uniform cuttings were cut to size (15 cm) and randomly assigned to one of 16 different treatments with 18 cuttings per treatment.

The experiment was a factorial design with four IBA concentrations (0, 1000, 3000, or 8000 ppm IBA as either no treatment or Hormodin® 1, 2, or 3, respectively); two rooting substrate types [2:1 or 4:1 perlite:peat (by volume)]; and two different rooting environments (an open mist bench or a mist bench enclosed by a white polyethylene tent; Fig. 1). Cuttings were stripped of foliage from the bottom 4 cm and wounded by cutting down to the secondary xylem at 15 mm on one side of the cutting and scraping off the bark from that point down to the bottom end. The wounded region was then moistened and dipped in the appropriate hormone to a depth of 15 mm. Immediately afterwards, each cutting was stuck into its respective, pre-moistened medium in 606 flats (63.5×63.5 ×76.2-mm cells) and placed on the bench within its respective rooting environment (Fig. 1). All cuttings were in the same greenhouse with 18/15.5°C day/night temperature set points, 16 h days, and bottom heat at 21°C. The cuttings were intermittently misted on the open mist bench for 7 s every 30 min and in the polyethylene tent for 30 s at 9:00 AM, 1:00 PM, and 5:00 PM. Misting was with de-ionized water and cuttings were irrigated as needed with culinary water. There were three replications per treatment, with each consisting of six cuttings in individual cells in the six-packs.

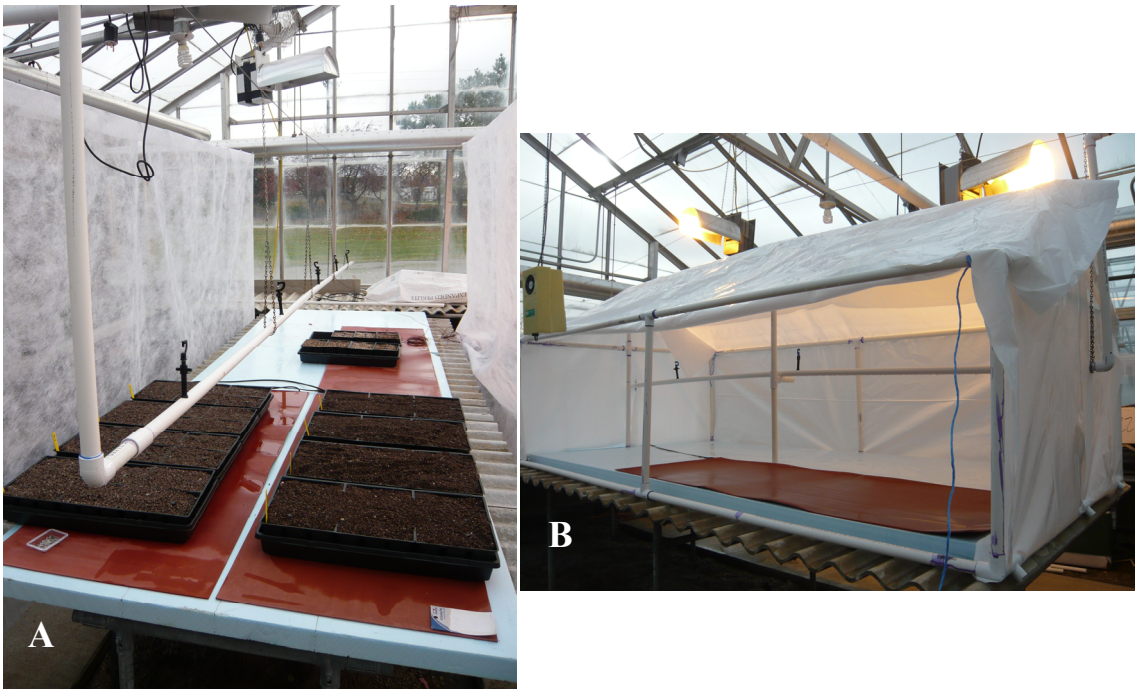

Fig. 1. (A) Mist bench and (B) Polyethylene tent environments used for propagating the Utah juniper cuttings both years.

Both years, at 8 weeks post-sticking, all cuttings were removed from the media and analyzed. Both rooted and unrooted cuttings were re-stuck in their respective cell and returned to their previous conditions. In 2010, rooting data from cuttings rooted at 8 weeks was combined with that of newly rooted cuttings at 16 weeks for the final analysis. In 2011, all cuttings were re-analyzed at 16 weeks for the final analysis. Presence of roots, number of roots per cutting, length of longest root, presence of callus, and foliar status were noted.

A generalized linear mixed model was used to analyze the data collected for both years at 16 weeks. The model was developed to predict the effect of each experimental variable on rooting and the number of roots. Since rooting for each cutting was a binary response (rooted or non-rooted), root development was modeled as the probability of rooting. For the number of roots, only rooted cuttings were analyzed. The original number of roots were square-root transformed and then analyzed using the mixed model. All analyses were performed using the PROC GLIMMIX package in SAS 9.3.

RESULTS AND DISCUSSION

In 2011 and 2012, at 8 weeks post-sticking, 6 and 4% of the cuttings rooted, respectively; however, at 16 weeks, the total fraction of rooted cuttings was greater: 24 and 26%, respectively (Fig. 2). As IBA concentrations increased, both frequency of rooting and number of roots increased (both p-value <0.0001). Rooting was also more frequent in the 2:1 medium compared to the 4:1 (p-value = 0.0072). In the white polyethylene tent, rooting was more frequent compared to the mist bench (p-value = 0.0409) and the foliage appeared healthier (data not quantified). Neither medium nor environment had an effect on number of roots.

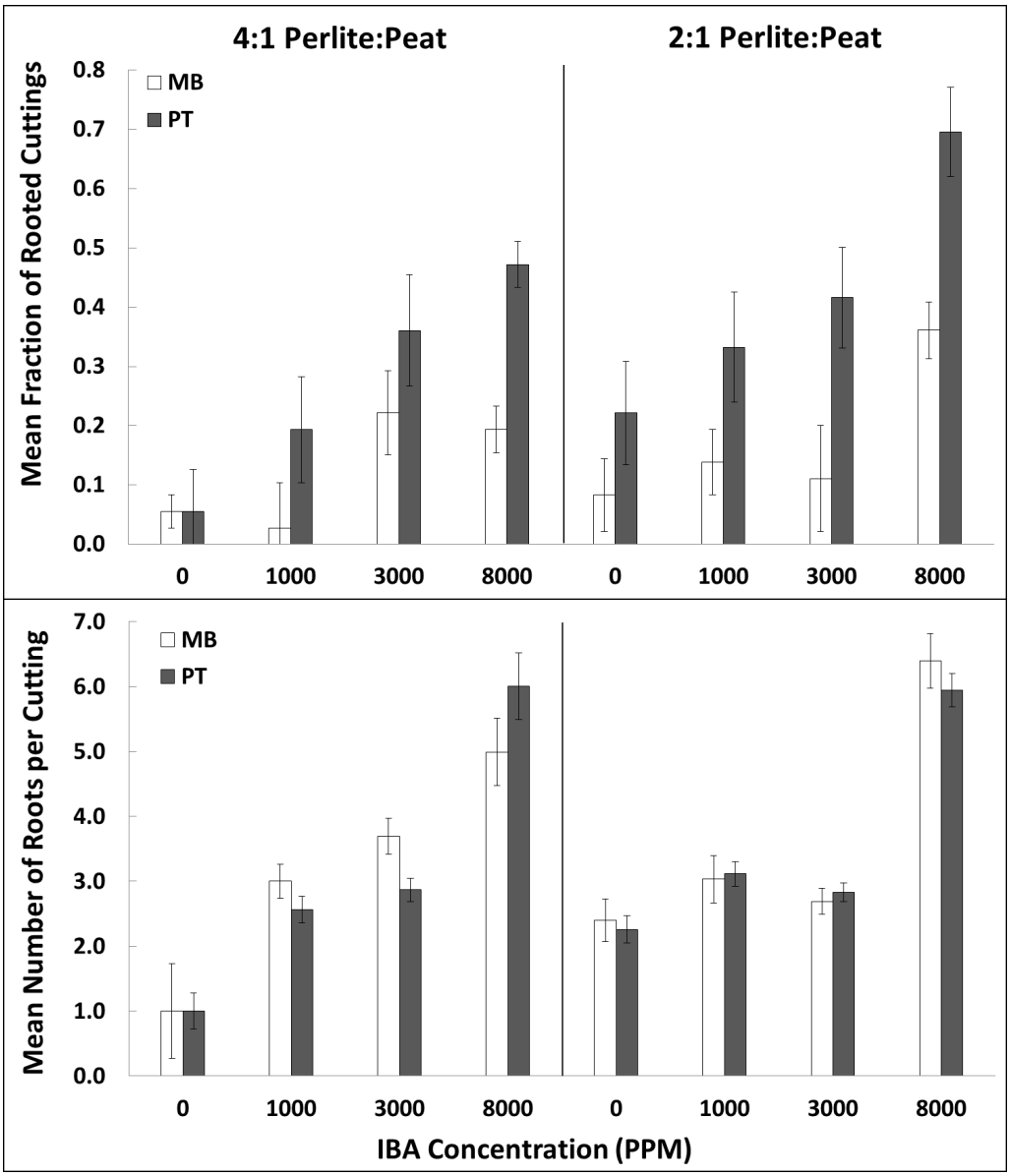

Fig. 2. Effect of rooting hormone, rooting substrate, and bench environment on the mean fraction of rooted cuttings (top) and the number of roots per rooted cutting (bottom). Treatments and abbreviations are: 4:1 and 2:1 perlite:peat (4:1 or 2:1); 0, 1000, 3000, and 8000 ppm IBA as Hormodin 1, 2, or 3 (H0, H1, H2, and H3). Data is combined over 2011 and 2012 with the standard error of the mean determined (error bars).

CONCLUSION

In both 2011 and 2012, the highest rooting percentages (66 and 72%, respectively) were found in the 8000 ppm IBA, 2:1 perlite:peat treatment in the polyethylene tent. We recommend using these variables for successfully propagating Utah juniper.

Literature Cited

Reinsvold, R.J. and Reeves, F.B. 1986. The mycorrhizae of *Juniperus osteosperma*: identity of the vesicular-arbuscular mycorrhizal symbiont, and resynthesis of VA mycorrhizae. Mycologia 78:108-113.