Propagation of Gambel oak (*Quercus gambelii*) by layering©

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Abstract

Gambel oak (*Quercus gambelii*) has potential as a small, drought tolerant tree for landscapes in the southwestern United States. Vegetative propagation of Gambel oak by mound layering was examined in Kaysville, Utah, from 2012 to 2015. Layering was done by pruning trees to their base each year and then gradually mounding conifer shavings around the base of each tree as new shoot growth occurred throughout the season. Shoots were girdled and treated with auxin in July of each year or left untreated as controls, and harvested in October or November of each year. Rooted layers were transplanted into 1-gal. pots and grown in a greenhouse for observation. Rooting of treated shoots and controls increased with age of the stock plants and with use of auxin. Further research to improve survival of the rooted layers will be needed.

INTRODUCTION

Gambel oak (*Quercus gambelii* Nutt.) is native to the American Southwest, readily hybridizes with other white oaks, and has potential as a small, drought tolerant landscape tree. However, seedling trees are variable and production of superior selections of the species or its hybrids is limited by difficulties in asexual propagation. During 2012-2015, vegetative propagation of Gambel oak by mound layering was examined at the Utah Agricultural Experiment Station Farm in Kaysville, Utah.

MATERIALS AND METHODS

Stock plants of Gambel oak were established by planting a row of 18 5-gal. plants on 3-ft spacing in 2011. Irrigation was done with pop-up spray heads using a variety of timing configurations depending on the season and supplemented with hand irrigation as needed to keep shavings moist. Plants were fertilized with 0.5 lb. N per 1000 ft^2 annually. Layering was done by pruning trees to their base each year and then gradually mounding conifer shavings around the base of each tree as new shoot growth occurred throughout the season. Appropriate shoots were selected for layering and randomly assigned for controls or treatment within trees. A combined treatment of girdling (4×0.10-in. cable tie 1 cm above the shoot base) and auxin (4000 ppm indolebutyric acid and 2000 ppm naphthalene acetic acid as Dip'N Grow® in 25% ethanol applied to the 3 cm of stem immediately above the girdle) was applied in early July of each year. The data for 2013 was pooled from shoots receiving the 4000/2000 ppm auxin treatment or 8000/4000 ppm auxin treatment since there was no apparent difference in rooting between the two. As stock plants grew, the number of shoots used for layering increased from one to five per plant.

Rooted layers were harvested in late October or November by cutting the stem as close as possible to the base and then held in moist shavings at 4°C until transplanted. The number of roots per shoot, stem length, and stem diameter were measured each year. In 2015, layers were harvested on 20 November and held at 4°C until transplanted on 4 March 2016. Prior to transplanting, the diameters of the largest three roots per shoot were measured. Rooted layers were transplanted into 1-gal. pots with a 2:1 perlite and peat substrate and randomly placed in a greenhouse at 65/60°F DT/NT until budbreak, after which they were grouped by parent tree for observation.

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RESULTS AND DISCUSSION

There was a marked increase in rooting of layers from 2012-2015 for both the control (4, 8, 21, 49% year^{-1}, respectively) and the treated shoots (17, 35, 56, and 65% year^{-1}, respectively). Analysis of the probability of rooting over the 4-year period using the GLIMMIX procedure of SAS (0.05 significance level) showed a significant effect of both time and the girdle/auxin treatment. The reason for increased rooting with age of stock plant is unknown. A similar analysis of the number of roots per rooted layer showed no statistical significance due to time or treatment. Among the rooted layers transplanted, there was no significant impact of treatment on survival. However, there was a correlation between the average diameter of the largest three roots per shoot and subsequent survival. On an observational level, only 13% of controls and 21% of treated shoots from 2015 survived and grew, indicating that improvements are needed before this method is commercially viable for propagation of Gambel oak.