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A new method of propagating this challenging tree shows promise for producing uniform specimens.

CLONING Live Oak

by DR. GENHUA NIU *and* DR. YIN-TUNG WANG

ive oak *(Quercus virginiana)* is an important landscape and shade tree species native to the southeastern US. This species is distributed naturally from Texas, east to Florida and north to Virginia. It is the state tree of Georgia and is considered to be the Southern symbol of strength. Its dark green leaves are simple, alternately arranged and may persist on the tree through winter until they fall immediately before new leaves emerge in the spring. For this reason, the tree often is mistaken as an evergreen.

Oaks commonly are propagated by seed. There are reports in horticultural research literature that studied the propagation of various oak species by tissue culture. However, nearly all studies obtained explants from plantlets soon following seed germination or from very young seedling plants. The drawback of such studies is that it is not known whether the regenerated plants would produce trees with desirable characteristics.

Live oak traditionally is propagated by planting acorns collected in the fall. Seedling trees, though, exhibit tremendous variability in leaf morphology, tree form and growth rate. Many seedling live oak trees produce a massive network of rhizomes just beneath the earth's surface under the crown, which turn into shoots and cause a problem in ground maintenance (photos, opposite). Rooted cuttings taken from established trees with desirable forms largely are unsuccessful, having a survival rate less than 25 percent. However, rhizomic shoots are juvenile in nature and readily can be rooted from trees with desirable traits. Because rhizomic shoots grow year-round, cuttings can be taken at any time of year. Our research has shown that trees propagated from these rhizomic shoots had growth rates similar to those propagated from seed after several years.

Rooting cuttings. In one study conducted at Weslaco, TX, in April 1987, 8-inch-long tip cuttings of rhizomic shoots were collected in April and dipped briefly in 1,250, 2,500, 5,000 or 10,000 parts per million (ppm) IBA solution containing 50 percent ethyl alcohol. These cuttings were rooted in a mist propagation bed in a mix of three parts perlite to 1 part peat (by volume). Those dipped in 10,000 ppm IBA had 100 percent rooting in 40 days. All cuttings treated with 2,500 or 5,000 ppm IBA rooted in 70 days, whereas those treated with 1,250 ppm IBA required 100 days to reach completed rooting.

Cuttings not treated with the IBA had 58 percent success after 100 days. However, increasing IBA concentration resulted in shorter root lengths.

Cuttings taken from the crown of a 40-year-old tree treated with 2,500, 5,000 or 10,000 ppm IBA had 25 percent success after 40 days. After 40 days, the unrooted cuttings produced large calli at the base of the cutting. They failed to root even after 100 days.

Growth of live oak trees propagated from cuttings or seed. Rhizomic shoot cuttings 10 to 12 inches in length were collected in late August 1990 from a live oak tree approximately 50 years old, dipped briefly in a solution of 50 percent ethanol and 5,000 ppm IBA and rooted in a mist bed. The rooted cuttings were planted in No. 1 pots two months after cuttings were collected. Acorns were collected from the same tree during the same week shoot cuttings were taken and germinated in 6-inch pots. Trees from both seedlings and rooted rhizomic shoots were planted into No. 5 pots in July 1991, then in the field in July 1992.

For trees from either source, four production systems were used: planting directly in the ground; in No. 5 plastic pots placed on the ground; or in 14- or 18-inch-diameter polypropylene fabric bags, which were filled with approximately 7 and 13 gallons of field soil, respectively, and buried in the ground. The No. 5 pots were anchored using four iron rods with a hook on top. All pots and bags were drip-irrigated and received the same amount of fertilizer during the growth period. To monitor the growth, tree circumferences were measured yearly, and the cross-section areas were calculated.

Trees were well-established in the field (photo, below). In 1992, there was no difference in growth between the cutting-propagated and the seedling trees. During the initial four years following field planting, trees from cuttings grew slightly slower than seedling trees, based on trunk circumference and crossectional area. These small differences in trunk circumference probably were not commercially significant. The differences diminished, and all trees had similar circumferences after 1996.

Cloned trees from rhizomic shoot cuttings were uniform in tree form and none produced rhizomic shoots. In contrast, growth habit and form of many seedling trees were highly undesirable. Approximately one-third of the seedling trees produced rhizomic shoots.

Rhizomic shoots of trees in pots and in-ground fabric bags were contained within the pot or bag, and none emerged from the ground nearby. Therefore, when planting seedling trees, placing a barrier around the base of the trunk may prevent the spread of rhizomes.

Seedling trees have nodes at the base of the stem that often is buried in the ground. When the buds on these nodes become active a few years following planting, they develop into underground rhizomes. After the tips have emerged from the soil and are exposed to light, they produce shoots. The basal ends of trees from rhizomic shoot cuttings did not have these nodes and did not produce rhizomic shoots by the time this experiment was terminated in 1999. When rooting cuttings, disbudding the lower nodes further will ensure the resulting trees do not produce rhizomic shoots.

In summary, the otherwise troublesome rhizomic shoots of live oaks have proved to be a good source of cuttings for producing cloned live oak trees with uniform growth and tree form. If these trees were to be sold during the first five to six years, trees grown from cuttings would have slightly thinner stems than those from acorns.

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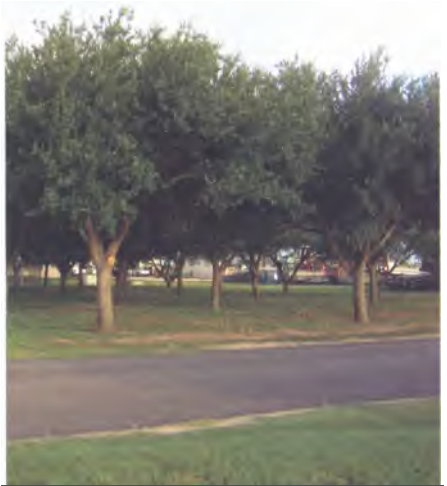
Rhizomic shoots that emerge beneath the crowns of live oak trees can cause maintenance nightmares. However, cuttings from such shoots tend to produce acceptably uniform trees.

These 10-year-old live oak trees were propagated from acorns or cuttings in 1990. The photo was taken in early 2000.



Cloned live oak trees propagated from cuttings in 1987 are pictured here in 2005.