Oak Production in Alkaline Soil: Advantages of *Quercus* ×*schuettei*

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Oak production is a challenging endeavor. At Johnson's Nursery, alkaline soil conditions and a B&B production system make it even more difficult. Our recent use of *Quercus* ×*schuettei* (*Q. bicolor* × *Q. macrocarpa)* has made field growing oak trees easier and more successful.

Historically, *Q. bicolor*, swamp white oak, has been one of the best species of oaks for B&B nursery production and landscape use. It has been easy to transplant because of its relatively fibrous root system. Swamp white oak has shown tolerance to heavy, compacted soils and has an adequate growth rate. Unfortunately, at Johnson's Nursery where the soil pH ranges from 7.2 to 7.6, *Q. bicolor* usually becomes chlorotic due to nutrient deficiency. Lowering the pH with applications of granular sulfur to the soil has not been a satisfactory remedy for this problem.

Quercus macrocarpa, bur oak, is another oak species with great potential as a landscape plant. This long-lived species has an adequate growth rate and is extremely tough. It is tolerant of many soil types and survives drought. Unlike swamp white oak, bur oak thrives in alkaline soils.

A major drawback to bur oak is its poor transplantability. Because of its very coarse, deep root system, it is very hard to move successfully. At Johnson's Nursery unacceptably large losses have occurred when transplanting 5-, 6-, and 7-ft bareroot whips of this species in spring. There has also been a problem with transplanting large-sized B&B bur oak trees. Oftentimes, so few roots are present that the root balls fall apart while digging or handling. Even trees with solid root balls frequently don't survive transplanting.

In 1989, we made an observation that prompted us to begin growing *Q.* ×*schuettei* seedlings. We noticed that our blocks of *Q. bicolor* trees were chlorotic and growing very poorly, except for an occasional tree. The chlorotic trees were no surprise to us. We had experienced similar alkaline-soil-induced deficiency symptoms on *Acer rubrum* in the past. We concluded the same malady was plaguing our swamp white oak blocks. However, we did not understand why a few trees grew exceptionally well with deep, dark green leaves. These healthy trees were located randomly in the blocks, indicating to us that no drastic pH changes were present. We theorized that the genetic make-up of these healthy seedlings may have enabled them to grow in alkaline soil. We thought that these standout trees may have had some bur oak "blood" in their genetic background.

Knowing that a hybrid between *Q. bicolor* and *Q. macrocarpa, Q.* ×*schuettei*, did exist (Miller and Lamb, 1985), we began searching for trees that fit its description in wild areas of Southeast Wisconsin. We went to areas where the two species, *Q. bicolor* and *Q. macrocarpa,* occurred in close proximity to each other, sometimes side by side. These areas were typically lowland settings that graded upward into bur oak openings. We found some trees with intermediate characteristics. We saw trees with acorns that looked like bur oak yet had the flaking, exfoliating bark which is

characteristic of swamp white oak. Some trees had typical swamp white oak acorns with 2-in.-long fruit stalks yet had fringing on the edge of the caps like bur oak. Some trees had many swamp white oak characteristics, except the leaves looked consistently like bur oak with deep lobing, almost to the mid-rib near the middle and base of the leaves. Several of the trees had extremely large acorns, larger than any of either species we had seen in the area.

Acorns were collected from trees thought to be hybrid. Records were kept to track individual mother trees of each seed lot. We planted acorns in field beds and harvested seedlings the following spring. They were root pruned to a 2- to 3-in.-long root stub and planted in a transplant bed for 1 year. The trees were dug again the following spring and graded for root quality. Those with poorly branched root systems were discarded. Trees with quality root systems were root pruned again and planted in close rows 1 ft apart for production of whips. The close-row trees were kept as pest-free and weed-free as possible. They were band fertilized three times a year with a slow release, 19N-6P_2O_5-8K_2O, fertilizer. The following spring, the trees were undercut. The second year in close rows, the oaks received identical treatment as the previous year, except they were not undercut. In spring of the third year, the tops of the oaks were cut to a 2- to 3-in. stub. Shortly thereafter, shoots emerged from the stub. One shoot was selected, and all others were removed. A Gro-straight® stake was placed next to the tree to prevent dog-legs. The trees were staked with 5-ft steel rods and tied to the rods periodically. A leader was maintained on the trees, and all side shoots were removed. Fertilization and insect control continued. At the end of the third season in close rows, 3-, 4-, and 5-ft whips were available for lining to the field for B&B tree production. Throughout the time when trees were in close rows, culling was done of chlorotic trees. Depending upon the seed source, chlorotic culls made up only 1% to 10% of the *Q.* ×*schuettei* crop. The whips were spring dug, graded, and lined 4 ft apart in the same high pH nursery soil.

The transplanting of the *Q.* ×*schuettei* whips was successful with losses being reduced dramatically compared to experiences with *Q. macrocarpa* in previous years. The health and growth rate of the trees also improved tremendously. Chlorotic trees, so common in earlier blocks of *Q. bicolor* were uncommon in these new blocks of *Q.* ×*schuettei*. This spring we dug *Q.* ×*schuettei* B&B for the first time. Preliminary results look promising. The few 1-1/2-in.-caliper trees that were dug for sales transplanted well.

It seems that the use of *Q.* ×*schuettei* may enable Johnson's Nursery to meet the increasing demand for native oak trees. Furthermore, this hybrid which tolerates alkaline nursery soils may also prove to tolerate the tough conditions of urban landscapes.

LITERATURE CITED

Miller, H.A. and **S.H. Lamp**. 1985. Oaks of North America. Naturegraph Publ., Inc. Happy Camp, California.

BILL BARNES: When you take the side shoots off the oak stems do you remove them close to the main stem?

MICHAEL YANNY: We pinch them out close to the stem.

BILL BARNES: If you leave a little stem that will encourage the main stem to increase in caliper and then in the fall you can trim the short stubs off.

I have a further comment relating to the last paper and weevils in oak seeds. If you put the seeds in a plastic bag and place them in a refrigerator at 35F for 3 days all the weevils will leave the seeds and concentrate on the bottom of the bag.

On another subject, you can encourage branching of oaks by selectively moving the containers in and out of a polyhouse because direct sun will stimulate lateral branches.

KEN TWOMBLY: Is there any likelihood that the hybrids will not be able to tolerate wet sites.

MICHAEL YANNY: We are looking for the hybrids at lowland sites were the swamp white and bur oaks overlap. So I suspect they will have tolerance to the lowland conditions.