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Research Reports:

Effect of Selected Pruning Methods to Obtain Straight Trunks on Container Grown Quercus shumardii Buckl.¹

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Abstract

Quercus shumardii seedling trees in 7.6 l (2 gal) containers were selected with straight and crooked trunks and planted in 26 l (7 gal) containers on March 13, 1987. Pruning treatments to trees with straight and crooked trunks were: (A) not pruned; (B) lower lateral branches on the trunk headed back; and trunks severed at 5 cm (2 in) on (C) March 30, 1987 or (D) May 13, 1987 with lower lateral branches arising on the forced new trunk headed back. Trees were allowed to branch normally above 91 cm (3 ft). The study was terminated October 19, 1987.

Tree height and trunk quality of trees with straight trunks were not improved by pruning treatments. Height of trees with crooked trunks was not reduced by heading back laterals only, or by severing trunks on March 30, 1987. Trunk quality of trees with crooked trunks was substantially improved by all pruning treatments, although the resultant trunk quality was not equal to that of trees with straight trunks. Severing trunks 5 cm (2 in) above the growth medium and heading back lateral branches on the lower trunk reduced caliper and the number of branches above 91 cm (3 ft). Delaying severing of trunks approximately 6 weeks after bud break caused a further reduction of trunk caliper.

Index words: oak, shade trees, landscaping/gardening, growth control

Introduction

The production of container grown trees with a central leader and a straight, smooth, branchless lower trunk is a common market objective of nurserymen. Growing trees in containers at close spacing, staking them to prevent lodging and crooked stems and removing all lateral branches along the lower trunk generally results in taller trees with weaker trunks (reduced caliper and taper) and smaller root systems (1, 2, 3, 4). The temporary retention and pruning back or heading back of lateral branches on the lower trunk is helpful in increasing the caliper of container grown trees (3, 4). The temporary lateral branches are removed several months before marketing to allow time for healing and to obtain smoother trunks. With trees that do not naturally develop a central leader and have multiple leaders it is also necessary

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to prune or head back all leaders except the straightest one to develop a central leader.

Several nurserymen have brought to the attention of the author an alternative method of obtaining trees with straight trunks. Seedling liners are planted in containers, usually 1- or 2-gallon size, or in the field and grown (usually) for one growing season without pruning. The following late winter or early spring the trunks of these trees are severed approximately 5 cm (2 in) above the soil. All shoots except the strongest straightest one arising from the stump are removed. The selected shoot is forced using accepted pruning practices to develop temporary lateral branches on the lower part of the trunk and heading back all multiple leaders except the strongest straightest one. This method of pruning to produce trees is also a common practice among shade tree growers in middle Tennessee (5). Trees produced in this manner may have straighter trunks than those not severely pruned—without a loss in caliper or height.

The objective of this study was to evaluate selected pruning methods to obtain straight tree trunks on container grown Quercus shumardii.

Material and Methods

The study was conducted at a nursery in South Mississippi where several thousand bare root Quercus shumardii seedlings were planted in 7.6 L (2 gal) containers in the spring of 1986 and grown can-to-can without pruning. Trees selected for this study were planted in 26 L (7 gal) containers on March 13, 1987 and grown at a spacing of 66 cm (26 in) on center. The growth medium was the residue of pine tree stumps (after processing to remove turpentine), fresh pine bark, fresh pine shavings and sand in a 3:1:1:1 ratio (by vol) amended with 1.8 kg/m$^3$ (3 lb/yd$^3$) of dolomitic limestone. A 12N-2.6P-5K (12-6-6) fertilizer was surface applied to the growth medium every 4 weeks through October 1987 at the rate of 20 grams (0.71 oz)/container. Dolomitic limestone was surface applied in June at the rate of 100 grams (3.53 oz)/container.

Equal numbers of trees with very straight trunks and very crooked trunks were selected, with each trunk type subjected to 4 treatments. Trees with straight trunks had very few lateral branches and a strong central leader. Trees with crooked trunks had more lateral branches, and were shorter with a very poor or non-distinguishable central leader. The 8 treatments were a $2 \times 4$ factorial (Table 1). Treatments were replicated 14 times with one container-plant as an experimental unit. The average height and caliper of trees with straight trunks were 97 cm (3.2 ft) and 11 mm (0.43 in), respectively. The average height and caliper of trees with crooked trunks were 78 cm (2.6 ft) and 11 mm (0.43 in), respectively. Tree height was measured from the container rim and trunk caliper was measured 15 cm (6 in) above the container rim.

Timing of treatments where trunks were severed was March 30, 1987 (when the first leaves were unfolding after spring bud break) and on May 13, 1987 (Table 1). The strongest straightest shoot arising from the stump was selected to develop the central leader.

All terminal shoots except 1 on all trees (except checks) were pruned as required to maintain a central leader until the trunks were 91 cm (3 ft) in length. Trees were allowed to branch normally above this height. Lateral branches below this height (except checks) were pruned to a length of 15 to 20 cm (6 to 8 in). Lateral branches were removed only after the trees were 137 cm (4.5 ft) tall to avoid removal of an excessive amount of foliage on small trees.

Heading back of all leaders (except one to obtain a central leader) and lateral branches below 91 cm (3 ft) on the central leader were performed every 2 weeks in May and June and monthly thereafter. The study was terminated on October 19, 1987. Tree height and caliper were recorded as previously described. To facilitate trunk quality evaluations, lateral branches below 91 cm (3 ft) were removed from all trees (including checks). Visual ratings of trunk quality were recorded with 10 = very straight trunks and 0 = very crooked trunks.

Results and Discussion

Quercus shumardii produced several growth flushes during the growing season, each beginning with simultaneous

### Table 1. Effects of trunk selection and trunk pruning method on tree height and trunk quality.

<table>
<thead>
<tr>
<th>Trunk selection</th>
<th>Trunk pruning method</th>
<th>Lateral</th>
<th>Tree height (cm)</th>
<th>Trunk qualitya</th>
</tr>
</thead>
<tbody>
<tr>
<td>straight</td>
<td>check, (not pruned)</td>
<td>—</td>
<td>160 ab*</td>
<td>8.2 abc</td>
</tr>
<tr>
<td>straight</td>
<td>not severed</td>
<td>headed back</td>
<td>181 a</td>
<td>9.1 a</td>
</tr>
<tr>
<td>straight</td>
<td>severed 3/30/87</td>
<td>headed back</td>
<td>168 ab</td>
<td>8.9 a</td>
</tr>
<tr>
<td>straight</td>
<td>severed 5/13/87</td>
<td>headed back</td>
<td>167 ab</td>
<td>8.4 ab</td>
</tr>
<tr>
<td>crooked</td>
<td>check, (not pruned)</td>
<td>—</td>
<td>131 c</td>
<td>1.6 e</td>
</tr>
<tr>
<td>crooked</td>
<td>not severed</td>
<td>headed back</td>
<td>179 a</td>
<td>6.4 cd</td>
</tr>
<tr>
<td>crooked</td>
<td>severed 3/30/87</td>
<td>headed back</td>
<td>158 ab</td>
<td>6.7 bcd</td>
</tr>
<tr>
<td>crooked</td>
<td>severed 5/13/87</td>
<td>headed back</td>
<td>148 bc</td>
<td>5.8 d</td>
</tr>
</tbody>
</table>

Significant effects
- Trunk selection
- Trunk pruning method
- Trunk selection $\times$ Trunk pruning method

*Trunk quality rating: 10 = very straight trunk, 0 = very crooked trunk.
*Mean separation within columns by Fisher's protected LSD, 5% level.
NS, **Nonsignificant or significant at the 0.01% level, resp.

Table 2. Effects of trunk selection and trunk pruning method on trunk caliper and the number of terminal branches above 91 cm (3 ft).

<table>
<thead>
<tr>
<th>Trunk pruning method</th>
<th>Laters</th>
<th>Caliper (mm)</th>
<th>Number of terminal branches</th>
</tr>
</thead>
<tbody>
<tr>
<td>check, (not pruned)</td>
<td>—</td>
<td>18 a</td>
<td>6 b</td>
</tr>
<tr>
<td>not severed</td>
<td>headed back</td>
<td>19 a</td>
<td>12 a</td>
</tr>
<tr>
<td>severed 3/30/87</td>
<td>headed back</td>
<td>15 b</td>
<td>2 c</td>
</tr>
<tr>
<td>severed 5/13/87</td>
<td>headed back</td>
<td>12 c</td>
<td>2 c</td>
</tr>
</tbody>
</table>

Significant effects
- Trunk selection
- Trunk pruning method
- Trunk selection \* Trunk pruning method

Caliper measured 15 cm (6 in) above the container rim.

Mean separation within columns separated by Duncan's multiple range test, 5% level.

NS, **Non-significant or significant at the 0.01% levels, resp.

bud break of several terminal buds resulting in a whorl of several shoots. A very slight to severe dog leg effect was obtained with each growth flush which could (without pruning) result in a crooked tree trunk.

The height of trees with straight trunks was not affected by pruning method (Table 1). The height of trees with crooked trunks was substantially increased by the 2 pruning treatments, laterals headed back and trunks severed on March 30, 1987. Tallest trees were obtained by heading back laterals and not severing trunks (Table 1). High trunk quality ratings were obtained with trees with straight trunks regardless of pruning method (Table 1). Trunk quality ratings were extremely poor with check trees with crooked trunks. Trunk quality ratings of trees with crooked trunks were substantially improved by all pruning treatments. Trunk quality, however, was not equal to that obtained with trees with straight trunks (Table 1).

Trunk caliper was not reduced when only the laterals were headed back. Severing trunks reduced caliper, especially when delayed approximately 6 weeks after spring bud break (Table 2). The number of shoots or branches above 91 cm (3 ft) was greatest with trees with laterals headed back and trunks not severed. The growth of forced trunks of trees severed was very rapid and very little branching occurred on these trees above 91 cm (Table 2).

No improvement in trunk quality was obtained by severing the trunks of trees with straight trunks, and such pruning resulted in an undesirable decrease in caliper. Trunk quality of trees with crooked trunks was improved without a decreased caliper only by heading back laterals. Although trunk quality of trees with crooked trunks was improved by all pruning treatments, it was still inferior to the trunk quality obtained with trees with straight trunks. Seedling tendency to produce crooked trunks is apparently inherent. Removing the established trunk by severing was very helpful but did not entirely overcome seedling tendency to produce crooked stems. However, trunk quality of trees with moderately crooked trunks (visual ratings in the range of 6–7) can be expected to improve in 1 or 2 growing seasons since subsequent trunk growth usually results in smoother, straighter trunks.

Significance to the Nursery Industry

Container production of Quercus shumardii trees, of good quality, with straight trunks can be produced most economically by heading back laterals. For trees with crooked trunks initially, two treatments (heading back laterals on the lower trunk only; and severing trunks/heading back laterals on the lower trunk) were substantially corrective and improved trunk quality. However, the practice of severing the trunks resulted in a decrease in trunk caliper and number of terminal branches, which could increase production time and costs. The pruning practice of only heading back laterals on the lower trunk appears to be a more advantageous method since trunk quality was improved without a corresponding reduction in trunk caliper and number of terminal branches.

Literature Cited