EVALUATION OF ‘CHANDLER’ GRAFTED ON VARIOUS ROOTSTOCKS INCLUDING ITS OWN-ROOTED ‘CHANDLER’ – 2003

Bill Olson, Jed Walton, Samuel Metcalf, and Sean Miller

ABSTRACT

Reports that “own rooted” Chandler walnuts (Chandler clone) out preformed grafted trees stimulated the creation of a replicated trial to investigate the performance of Chandler clone trees, trees grafted to three selections of paradox rootstock and trees grafted to a vigorous English rootstock. Rootstock trees were planted in March 1999 at the California State University Farm in Chico. Tops were grafted with Chandler clone scion wood in the spring of 2000. Initial survival, yield and trunk cross sectional area (TCSA) data collection began in 2001. Catkin abundance, yield and TCSA data was collected in 2003 and reported.

OBJECTIVES

The objectives of this trial are to validate or refute the following hypothesis:

1. Graft union has a limiting effect on tree growth and productivity.
2. Chandler is a superior English rootstock.
3. Clonal paradox has less variation than paradox seedling rootstocks.
4. Chandler clone trees are superior to Chandler on paradox.

PROCEDURES

The following six treatments are being evaluated:

1. Chandler clone via tissue culture.
2. Chandler clone via tissue culture grafted to Chandler clone.
3. English (Waterloo) rootstock grafted to Chandler clone.
6. Clonal paradox (PX1), grafted to Chandler clone.

Small (3/8” diameter) rootstocks for these six treatments were planted on March 19, 1999 in a randomized block design with six replicates made up of two trees per replicate. Top working (grafting) took place in the spring of 2000. Failed grafts were fall budded in the fall of 2000. Initial tree survival data was collected in 2000. 2003 catkin abundance, tree growth measured as trunk cross sectional area (TCSA) and yield data is reported.
RESULTS

Initial tree survival in 2000:
Treatment 1 = 100 %             Treatment 4 = 58 %
Treatment 2 = 100 %             Treatment 5 = 75 %
Treatment 3 = 92 %              Treatment 6 = 100 %

In 2003 one tree from treatment 5 died making the % survival 67%.

Presence of crown gall:
Treatments 4 and 6 each had one visible crown gall.

Catkin abundance:
Using a rating system of: 1 = no catkins; 2 = low number of catkins; 3 = moderate number of catkins; 4 = high catkin abundance and 5 = very high catkin abundance observations were that Chandler clone trees had an average catkin abundance rating of 1.2 while all other treatments averaged between 1.7 and 2.0. The catkin abundance on the Chandler clone tree was significantly less than that of all other treatments. (Graph 1)

Graph 1.

Treatments 4 and 6 each had one visible crown gall.

Using a rating system of: 1 = no catkins; 2 = low number of catkins; 3 = moderate number of catkins; 4 = high catkin abundance and 5 = very high catkin abundance observations were that Chandler clone trees had an average catkin abundance rating of 1.2 while all other treatments averaged between 1.7 and 2.0. The catkin abundance on the Chandler clone tree was significantly less than that of all other treatments. (Graph 1)

Graph 1.

Catkin Abundance

Treatment means not followed by a common letter are significantly different at the 5 % Level according to Duncan’s Multiple Range Test for Mean Separation.
Tree growth:
Where measurements were taken 36 inches above the ground Chandler clone trees (treatment 1) was significantly larger in TCSA than all other treatments and treatments two, four and six were significantly larger than treatment five (“Trinta” paradox). The “Trinta” paradox rootstock trees were similar in size to the English rootstock trees. (Graph 2).

Graph 2.

Mean TCSA (cm2)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mean TCSA (cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>BC</td>
</tr>
<tr>
<td>3</td>
<td>CD</td>
</tr>
<tr>
<td>4</td>
<td>BC</td>
</tr>
<tr>
<td>5</td>
<td>D</td>
</tr>
<tr>
<td>6</td>
<td>B</td>
</tr>
</tbody>
</table>

Treatment means not followed by a common letter are significantly different at the 5 % Level according to Duncan’s Multiple Range Test for Mean Separation.

Yield:
There was no significant difference in yield between any of the treatments (Graph 3).
DISCUSSION

This data suggest that the presence of a graft union has: 1) a positive influence on catkin abundance (Chandler clone trees without a graft union had significantly fewer catkins), 2) a negative effect on tree size (Chandler clone trees without a graft union were significantly larger) and 3) no effect on tree yield.

There is no evidence that Chandler clone rootstock is a superior English rootstock as compared to the English Waterloo rootstock used in this trial in any of the parameters measured. Clonal paradox appears to be similar in all traits measured compared to the common paradox rootstock. Except there was much more mortality in the common paradox and “Trinta” paradox rootstock than with the clonal paradox rootstock. Both the clonal paradox rootstock and common paradox rootstock were superior to the “Trinta” paradox rootstock in terms of tree size (TCSA).

There was no tree mortality from Chandler clone trees, Chandler clone trees grafted to Chandler clone rootstock or with Chandler clone trees grafted to the clonal paradox rootstock. Chandler clone trees on common paradox and on the clonal paradox rootstock each had one tree with visible crown gall.

Any advantage of having Chandler clone trees is not apparent from this trial unless having fewer catkins and larger trees at a young age is an advantage. There is no yield advantage in these forth leaf trees. However, a yield advantage could show up as the trees become older and larger. Less tree mortality could be an advantage but a larger trial with many more trees would be necessary to confirm these early results.