

# **EVALUATION OF ‘CHANDLER’ WALNUT ON ITS OWN ROOTS AND GRAFTED TO VARIOUS ROOTSTOCKS – 2006**

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## **ABSTRACT**

Reports that “own rooted” ‘Chandler’ walnuts out performed grafted trees stimulated the creation of this replicated trial. The performance of own rooted ‘Chandler’ trees, ‘Chandler’ grafted to own rooted ‘Chandler’, and ‘Chandler’ grafted to three paradox selections and to a vigorous English selection is investigated in this trial. Rootstock trees were planted in March 1999 at the California State University Farm in Chico. Scions were grafted using wood collected from mature ‘Chandler’ trees in the spring of 2000. Initial survival, yield and trunk cross sectional area (TCSA) data collection began in 2001. Catkin abundance, leafing and husk split dates, tree yield, and trunk circumference data was collected in 2006 and is reported here.

## **OBJECTIVES**

The objectives of this trial are to investigate the following questions:

- a) Does a graft union have a limiting effect on tree growth and productivity?
- b) Is ‘Chandler’ a superior English rootstock?
- c) Do trees on clonal paradox show less variation than those on paradox seedling rootstocks?
- d) Are own rooted ‘Chandler’ trees superior to ‘Chandler’ on paradox?

## **PROCEDURES**

The following six treatments are being evaluated:

1. ‘Chandler’ own rooted via tissue culture (not grafted).
2. ‘Chandler’ grafted on own rooted ‘Chandler’ rootstock.
3. ‘Chandler’ grafted on English ‘Waterloo’ rootstock.
4. ‘Chandler’ grafted on common paradox rootstock.
5. ‘Chandler’ grafted on ‘Trinta’ paradox rootstock.
6. ‘Chandler’ grafted on ‘Px1’ paradox rootstock tissue cultured from the “Rawlins” tree.

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 with wood collected from mature ‘Chandler’ trees. Initial tree survival data was collected in 2000. In 2006, observations on catkin abundance and leafing and husk split dates were made. Measurements were made of tree growth expressed as trunk cross sectional area (TCSA), and yield data was collected. Yield efficiency was calculated and is also presented.

## RESULTS

### *Initial tree survival in 2000 on the various roots is as follows:*

'Chandler' not grafted = 100 %	Common paradox = 58 %
'Chandler' grafted = 100 %	'Trinta' paradox = 75 %
English 'Waterloo' = 92 %	'Px1' paradox = 100 %

In 2003 one additional tree on 'Trinta' paradox died reducing the survival to 67%.

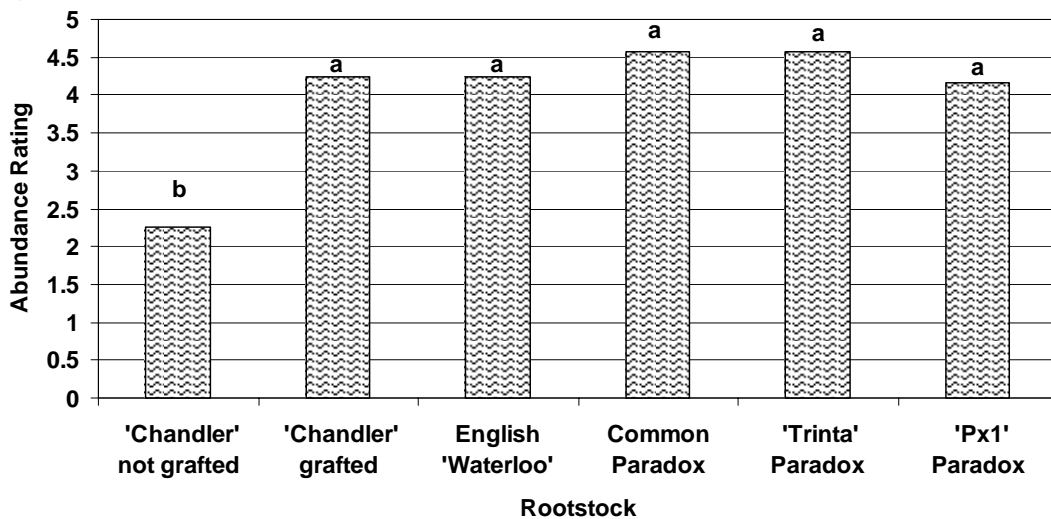
### *Presence of crown gall:*

As of a 2004 observation, one tree on common paradox and one tree on 'Px1' paradox were showing a visible crown gall. In 2006, Janine Hasey surveyed this trial for crown gall as part of a sabbatical leave project, data are not reported here.

### *Catkin abundance:*

Our subjective rating system is: 1 = no catkins; 2 = low number of catkins; 3 = moderate number of catkins; 4 = high catkin abundance; and 5 = very high catkin abundance. Observations in 2006 indicate that own rooted 'Chandler' trees have an average catkin abundance rating of 2.25 while all other grafted treatments averaged between 4.17 and 4.58. Catkin abundance on own rooted 'Chandler' trees was significantly less than that on all other treatments (Figure 1).

**Figure 1. Catkin Abundance - 2006**



Using Fisher's LSD procedure, different letters indicate significant differences between rootstocks at  $P < 0.05$

### *Leafing dates:*

Leafing date in 2006 was latest on own rooted 'Chandler' trees that were not grafted (Table 1). 'Chandler' on all other rootstocks leafed out at the same time this year, approximately 5 days earlier than trees on own rooted 'Chandler'.

**Table 1. 'Chandler' 2006 leafing date vs. rootstock.**

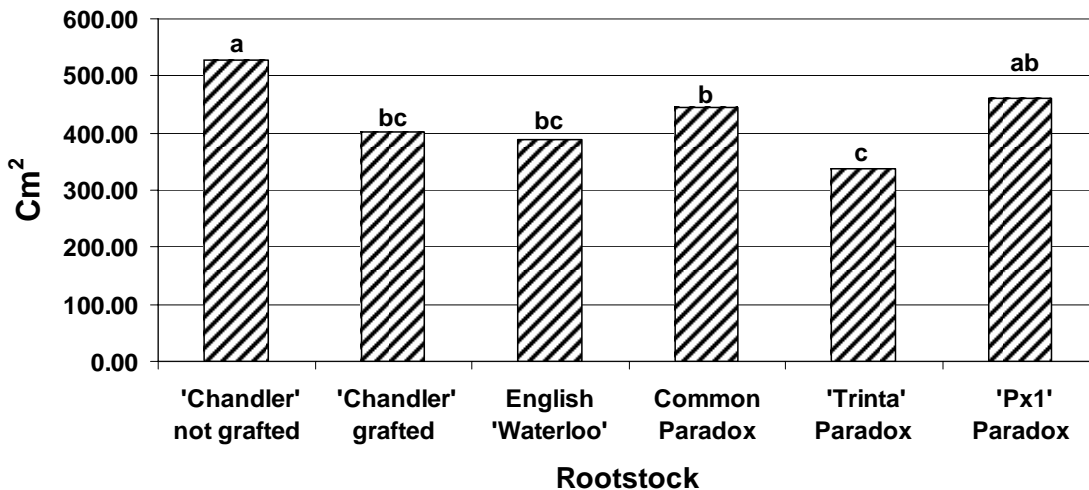
<u>Rootstock treatment</u>	<u>Leafing Date</u>
'Chandler' not grafted	April 28th
'Chandler' grafted / on 'Chandler'	April 23rd
'Chandler' / english 'Waterloo'	April 23rd
'Chandler' / common paradox	April 23rd
'Chandler' / 'Trinta' paradox	April 23rd
'Chandler' / clonal 'Px1' paradox	April 23rd

Rating of first two replicates only.

***Tree growth - Trunk cross sectional area (TCSA):***

Trunk circumference measurements are made on all trees approximately 36 inches above the ground. Own rooted 'Chandler' not grafted has had a significantly larger TCSA than all other treatments in past years. This year 'Px1' paradox gained on the own rooted 'Chandler' and the trees on this stock were not significantly smaller. Trees on 'Trinta' paradox rootstock are significantly smaller than all other treatments (Figure 2). Trees on the remaining rootstock treatments are intermediate in size.

**Figure 2. Mean 2006 Trunk Cross Sectional Area (cm<sup>2</sup>)**



Using Fisher's LSD procedure, different letters indicate significant differences between rootstocks at P < 0.05

***Harvest timing:***

In 2006, the crop on 'Trinta' paradox and 'Chandler' rootstocks displayed the earliest maturity compared to other treatments. 'Chandler' not grafted was the furthest behind in maturity when trees were rated on October 9, 2006. The English 'Waterloo', 'Px1', and common paradox rootstocks were intermediate in maturity this year (Table 2).

**Table 2. Rootstock effect on 'Chandler' husk split evaluated on October 9, 2006.**

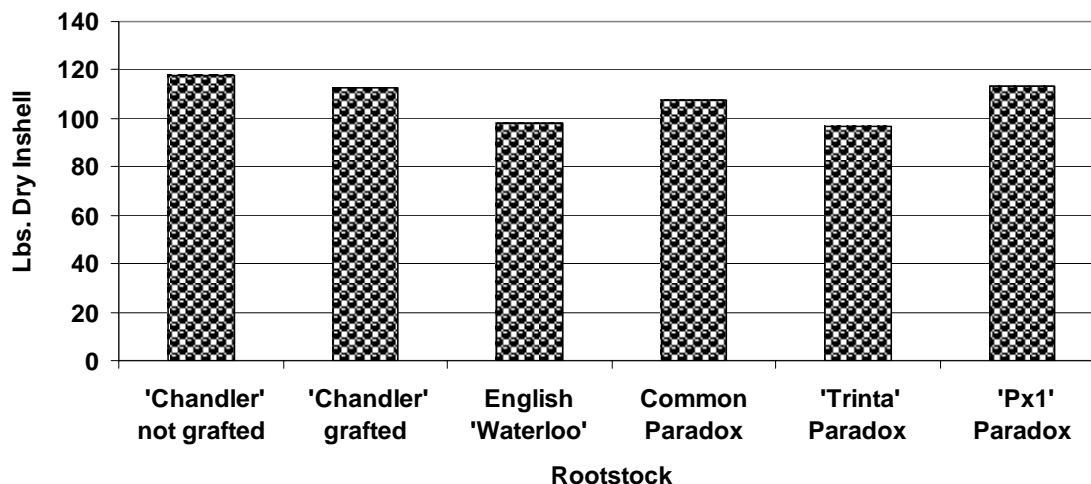
<u>Rootstock treatment</u>	<u>%Husk Split</u>
'Chandler' not grafted	85%
'Chandler' grafted / on 'Chandler'	94%
'Chandler' / english 'Waterloo'	90%
'Chandler' / common paradox	88%
'Chandler' / 'Trinta' paradox	95%
'Chandler' / clonal 'Px1' paradox	87%

Husk split rating based on 4 individual trees per treatment and differences are not significant. Actual harvest date: October 20, 2006.

***Yield:***

The 2006 season was the seventh growing season for scions in this trial. Although TCSA is still significantly different between treatments, trees in all treatments are beginning to fill their space in the orchard. As a consequence of more similar canopy size, average yield per tree was the same this year for all treatments. Differences seen between them are not significant at the 5% level (Figure 3).

**Figure 3. Mean 2006 Yield per Tree**

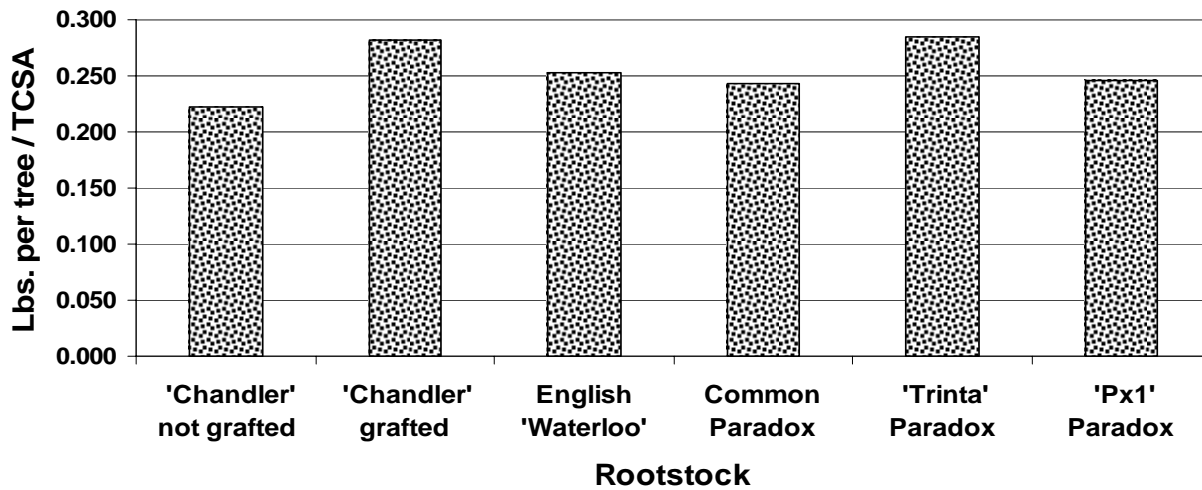


Using Fisher's LSD procedure, 2006 yield is not significantly different between rootstocks at  $P < 0.05$

***Yield Efficiency:***

Yield efficiency is tree yield divided by TCSA. This measure is designed to identify productivity differences that may not be related to tree size. Despite significant differences in TCSA presented earlier, yield efficiencies for 2005 are the same for all treatments. There were no significant differences between treatments (Figure 4).

**Figure 4. Mean 2006 Yield Efficiency**



Using Fisher's LSD procedure, 2006 yield efficiency is not significantly different between rootstocks at  $P < 0.05$

## DISCUSSION

The tissue cultured own rooted 'Chandler' not grafted trees are now eight years old and although the 'Chandler' scion wood was collected from mature trees we suspect that the effects of age difference between these two sources of wood have likely been overcome by this time.

Data so far suggests that the presence of a graft union has:

- 1) Increased catkin abundance ('Chandler' not grafted trees have significantly fewer catkins).
- 2) Reduced tree size ('Chandler' not grafted trees are significantly larger).
- 3) No effect on tree yield (all treatments had the same 2006 yield).
- 4) No effect on yield efficiency once the canopy of the trees has substantially filled their space in the orchard (all treatments had the same yield efficiency in 2006).

In all parameters measured there is no evidence that the English 'Chandler' rootstock is superior to the English 'Waterloo' rootstock used in this trial. 'Px1' paradox appears to be similar to the common paradox rootstock in nearly all respects. Common and 'Trinta' paradox rootstocks had greater initial mortality compared to the 'Px1' paradox. Both common and 'Px1' paradox rootstocks produced larger tree size (TCSA) than the 'Trinta' paradox rootstock.

There has been no tree mortality in 'Chandler' on its own roots either in grafted or not grafted trees or in trees on 'Px1' paradox rootstock. A visible crown gall was noted in 2004 on one tree on both common and 'Px1' paradox rootstocks and this is being re-evaluated by Janine Hasey.

Fewer catkins and larger trees at a young age is a possible advantage for own rooted 'Chandler' trees. Since an over abundance of pollen contributes to pistillate flower abscission (PFA), cultivars having significant PFA such as 'Serr' might benefit from being own rooted. Another advantage might be usefulness in areas with a high incidence of blackline virus. Without a graft union, English walnut would tolerate the disease. There are no yield differences between treatments in these eighth leaf trees. Lower initial tree mortality might be a consideration but a larger trial with many more trees would be necessary to re-confirm these limited results.