

# Pruning Trials for High Density Orchards

**John Edstrom**  
**Bill Krueger**  
UC Farm Advisors

## Rational

Almond tree training and pruning practices haven't changed much for decades. Traditional concepts stressed careful selection of primary and secondary branches to develop a strong evenly spaced framework capable of supporting heavy crops. Large trees developed during the 30-40 year life span especially at wide spacings. Yearly pruning was needed on old trees to increase light into the tall canopies, stimulate growth and replace unproductive fruitwood. Considerable time, equipment and expense are required to complete this type of pruning operation.

Today, however, tree densities have increased to 100+ trees/ac, twice what they used to be and many new orchards are planted on weaker ground. Both trends result in smaller sized trees, which don't need to support such heavy crop weight per tree to be productive per acre.

Scaffold number, position, orientation, or strength become less critical without large expansive canopies. Younger trees, typical of more tightly spaced orchards are inherently more vigorous so yearly pruning is not as critical to maintain vigor.

Shorter statured trees naturally allow more light to penetrate deeper into the canopy promoting fruit bud formation without much pruning to "open up the centers". Big cuts may not be necessary. Improvements in water management using microirrigation bring orchards into production fast (and impart vigor to older trees). Good yields are obtained in the 4<sup>th</sup> year compared to year 6 to 8 as in the past.

Many growers don't expect today's almond orchards to last longer than 20 years. Blocks will be replaced at a younger age simply to exploit new superior technology. These factors should all be considered when devising a profitable training/pruning strategy for today's high density orchards.

## Objective

The objective of this field trial is to evaluate various tree training/pruning methods, which promote maximum early production while maintaining long-term orchard yield in tightly spaced almonds.

Four training systems were selected using 4 replicates of 33 trees on Nonpareil, Carmel, Monterey and Aldrich, microsprinkler irrigated and planted at 16'x22', 124 trees/acre:

- 1) **Standard Method** - Three primary limbs selected at 1<sup>st</sup> dormant pruning, secondaries selected 2<sup>nd</sup> dormant, centers kept open, limb tying/staking as necessary. Yearly traditional, moderate pruning.
- 2) **Unpruned** - Three Primary limbs selected at 1<sup>st</sup> dormant pruning then no

additional pruning unless needed for equipment or wind damage, etc. Minimal staking as necessary.

- 3) **Mechanically Topped** - Same as unpruned, but, adding machine topping to remove half of prior seasons top shoot growth beginning at 2<sup>nd</sup> dormant with selective dormant thinning and topping in spring, if needed.
- 4) **Temporary Scaffolds** - Train limbs at 1<sup>st</sup> dormant to favor 3 permanent primary scaffolds, but also retain many other temporary branches below these on the trunk, removing only those which compete strongly with permanent scaffolds. Retain as much wood as possible. Temporary limbs scheduled for gradual removal during years 5-8 after producing some crop or sooner if they threaten primaries.

## Results

Overall tree vigor has been quite good in this planting. This should allow a strong test for the unpruned and other methods under strong growing conditions. The north end of the planting is more vigorous than the south, providing two distinct conditions to evaluate these training methods. In the previous evaluation of the unpruned method, weak growing conditions complicated drawing meaningful conclusions.

Yield results (Table 1) show good production from all methods in this 4<sup>th</sup> leaf block. The Unpruned and Temporary methods outproduced the Standard pruned trees, while the Mechanically topped trees yielded the least. Standard pruned trees tended to be the tallest with the topped trees the shortest. (Table 2) Trunk circumference measurements showed no difference between treatments (Table 3).

**Table 1.**

<b><u>YIELDS - LBS./ACRE</u></b>						
<b><u>Trial</u></b>	<b><u>Aldrich</u></b>	<b><u>Carmel</u></b>	<b><u>Monterey</u></b>	<b><u>Nonpareil</u></b>	<b><u>Sonora</u></b>	<b><u>*Mean</u></b>
<b>Standard</b>	1,143	1,108	1,617	934 bc	1,133	1,185
<b>Temporary Scaffold</b>	-	1,587	1,690	1,122 a	1,330	1,406
<b>Mechanically Hedged</b>	959	1,397	1,252	838 c	895	1,060
<b>Unpruned</b>	1,256	1,253	1,900	1,077 ab	1,459	1,374
<b>Mean</b>	1,119	1,336	1,615	992	1,204	
* = Weighted Mean (considers reduced number of pollenizer trees)				P = 0.10		

**Table 2.**

**TRUNK CIRCUMFERENCE**  
**(cm.)**

	<u>Average</u>
<b><u>Nonpareil:</u></b>	
<b>Standard</b>	NS 40.2
<b>Temporary Scaffold</b>	41.1
<b>Mechanically Hedged</b>	39.4
<b>Unpruned</b>	39.1

**Table 3.**

**TREE HEIGHTS (Ft.)**

<u>Pruning System</u>	<u>Carmel</u>	<u>Monterey</u>	<u>Nonpareil</u>	<u>Sonora</u>	<u>Aldrich</u>	<u>*Mean</u>
<b>Standard</b>	12.2	13.6	14.6	15.1	15.9	NS 14.2
<b>Temporary Scaffold</b>	13.0	12.3	14.3	13.5	-	13.4
<b>Mechanically Topped</b>	12.6	12.0	14.0	12.3	15.1	13.3
<b>Unpruned</b>	12.1	12.9	14.2	14.6	15.8	13.8
<b><u>Mean</u></b>	12.4	12.7	14.3	13.9	15.6	

\* = Weighted Mean (considers reduced number of pollenizer trees)

Specific observations on each training method are as follows:

**Temporary limb concept**

This method looks promising but some of the temporary lower limbs are competing too severely with the upper permanent ones. Often these permanent scaffolds appear smaller compared to those on standard pruned trees. Secondary limbs also bend more and lose their upright orientation in this treatment. Nonpareil and Monterey are affected the most, while Carmel and Sonora appear to be OK.

Ultimately, some temporary limbs could be maintained permanently which may add production and compensate for these weaker primaries. However, many of these are too low on the trunk and would prevent shaking. Careful training of competitive branches is critical to this method but properly training crews is difficult. Extra effort was given here this winter to favor the permanent primary and secondary scaffolds. Removal of strongly competing lower limbs and the vertical shoots arising from them was intensified especially on Monterey. Some Monterey trees will be maintained with many scaffolds permanently.

The dominance of the permanent scaffolds could not be maintained, lower competing limbs were too strong and equaled the size of permanent ones. The Aldrich variety proved too troublesome to maintain extra lower scaffolds and was eliminated from this treatment altogether.

### **Unpruned Method**

This method appears to have commercial potential. Within the weaker soil area, nearly all unpruned trees look acceptable. Nonpareil and Aldrich in the vigorous area appear a bit too dense in the upper canopy with more shading below but, crop load is now opening these up. Training these trees to three scaffolds the first winter should promote strong crotches and prevent the loss of primary limbs from crowding later. (However, this assumption is arguable. Multiple scaffold training may also succeed with the unpruned method.) Some unpruned Monterey trees appear misshapen and unbalanced but the Sonoras and Carmels look fine. Removal of twisted and rubbing limbs may be desirable with all varieties. There was no problem with crop removal at harvest.

### **Mechanically Topped**

All varieties in this treatment are shorter in height than in the other methods. Aldrich benefited the most from topping with better branching forming a wider canopy. But on most varieties, excessive shoot growth resulted from the dormant topping in 1999. This dense upright growth of 3 to 8 feet was cut 1/2 during the May 2000 topping. Cutting into last year's wood deinvigorated these trees

and reduced tree height. Yield loss from this unusually harsh topping was significant, some 300 lbs/ac. Regrowth of top shoots was moderate. Future spring topping will be set to remove mainly current shoot growth and promote the desired fruitwood density in the mid canopy. Some thinning of "crows feet" is needed.

### **Standard Pruning**

These trees are the tallest of all treatments and also exhibit the most open canopy. Primary scaffold development is good while some secondary limbs are bending out of position exaggerating the open center, especially on Nons. Maybe too many secondary limbs were left last winter. There appears to be less lower "hanger" fruitwood in this treatment. Sonoras look quite good.

### **Summary**

At this stage of the test the Unpruned Method, appears very attractive. With a small amount of pruning to remove badly angled, twisted, and interfering branches, this system may prove successful. The Unpruned system, which was successful at a 7 ft. spacing in the old test at Nickels on weak soil, may actually work here also under much more vigorous conditions. Many years of testing are needed. Monterey yields are impressive at 1900 Lbs/ac.

The Temporary Scaffold system shows some promise also. Although yielding the most, the expensive pruning involved makes this concept questionable.

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