Integration of Tree Spacing, Rootstock Selection & Pruning for Efficient Almond Production
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**Multifactorial Trial**
- 2 varieties
  - Nonpareil & Carmel
- 2 Rootstocks
  - Nemaguard & Hansen
- 4 Spacings
  - 22’ x 22’, 18’ x 22’, 14’ x 22’, 10’ x 22’
- 4 Pruning strategies

**Pruning Strategies:**
- Standard trained, standard pruned
  - 3 scaffolds, annual pruning, open centers
- Standard trained, unpruned
  - Trained with 3 scaffolds and open centers
  - Unpruned after 2nd dormant season
- Minimal training & pruning
  - Trained with 4-6 scaffolds & open centers;
  - maximum of 3 cuts per tree annually
- Untrained, unpruned
  - No scaffold selection, no annual pruning

**Influence of Tree Spacing on Cumulative Yield of 11th Leaf Nonpareil & 10th Leaf Carmel**

<table>
<thead>
<tr>
<th>Spacing</th>
<th>Carmel on Nemaguard</th>
<th>Carmel on Hansen</th>
<th>Nonpareil on Nemaguard</th>
<th>Nonpareil on Hansen</th>
</tr>
</thead>
<tbody>
<tr>
<td>22’ x 22’</td>
<td>20,317</td>
<td>18,530</td>
<td>21,741</td>
<td>20,505</td>
</tr>
<tr>
<td>18’ x 22’</td>
<td>21,403</td>
<td>19,072</td>
<td>22,048</td>
<td>21,129</td>
</tr>
<tr>
<td>14’ x 22’</td>
<td>22,692</td>
<td>20,403</td>
<td>23,539</td>
<td>20,725</td>
</tr>
<tr>
<td>10’ x 22’</td>
<td>24,215</td>
<td>19,157</td>
<td>22,903</td>
<td>20,319</td>
</tr>
</tbody>
</table>

*Yield data not collected 3rd leaf for either variety

**Conclusions for Tree Spacing through 11th leaf:**
- Cumulative yield for Carmel on Nemaguard is highest at 10’ x 22’ spacing and lowest for 22’ x 22’ spacing. Nonpareil on nemaguard is highest at 14’ x 22’ spacing.
- Yield for Nonpareil on Hansen (big trees) is similar at all tree spacings
- Carmel kernel size was smaller at the 10’ x 22’ spacing
- Widely spaced trees had 2.5 times more mummies per acre than closely planted trees

**The Effect of Pruning, Tree Spacing & Rootstock on Nonpareil (11th leaf) & Carmel (10th leaf)**

<table>
<thead>
<tr>
<th>Training / Pruning</th>
<th>Nonpareil</th>
<th>Carmel</th>
<th>Nonpareil</th>
<th>Carmel</th>
<th>Yield (lb / acre)</th>
<th>Kernels per ounce</th>
<th>Mummies / acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard training &amp; annual pruning</td>
<td>3203 a</td>
<td>3359 b</td>
<td>20.7 a</td>
<td>22.7 a</td>
<td>9,268</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trained two years, then unpruned</td>
<td>3457 a</td>
<td>3736 a</td>
<td>21.2 a</td>
<td>23.1 a</td>
<td>8,547</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple scaffolds and 3 pruning cuts annually</td>
<td>3241 a</td>
<td>3508 a</td>
<td>20.7 a</td>
<td>22.3 a</td>
<td>10,506</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Untrained &amp; unpruned</td>
<td>3395 a</td>
<td>3785 a</td>
<td>21.0 a</td>
<td>22.9 a</td>
<td>6,545</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Training / Pruning*

**Spacing**
- 10’ x 22’ 3397 a 3742 a 21.1 a 24.0 b 4,787
- 14’ x 22’ 3379 a 3621 a 21.1 a 22.5 ab 7,116
- 18’ x 22’ 3335 a 3529 ab 20.7 a 22.3 a 11,382
- 22’ x 22’ 3186 a 3297 b 20.7 a 22.9 ab 11,581

**Rootstock**
- Hansen 3287 a 3268 b 24.4 a 22.7 a 9,666
- Nemaguard 3324 a 3925 a 24.0 a 22.8 a 11,016

*Mummies counted on Nonpareil trees January 15, 2010"
The Influence of Pruning and Training on Cumulative Yield (lb / acre) of 11th Leaf Nonpareil & 10th Leaf Carmel*.

<table>
<thead>
<tr>
<th></th>
<th>Nonpareil on Nemaguard</th>
<th>Nonpareil on Hansen</th>
<th>Carmel on Nemaguard</th>
<th>Carmel on Hansen</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 scaffolds; annual pruning</td>
<td>21,812</td>
<td>20,348</td>
<td>21,687</td>
<td>17,289</td>
</tr>
<tr>
<td>3 scaffolds; delayed non-pruning</td>
<td>22,995</td>
<td>21,307</td>
<td>22,212</td>
<td>19,683</td>
</tr>
<tr>
<td>Multiple scaffolds, three cuts annually</td>
<td>22,191</td>
<td>19,646</td>
<td>21,855</td>
<td>19,520</td>
</tr>
<tr>
<td>No scaffold selection; no pruning</td>
<td>23,233</td>
<td>21,346</td>
<td>22,874</td>
<td>20,667</td>
</tr>
</tbody>
</table>

*Yield data not collected 3rd leaf for either variety

Conclusions on Pruning:

- Conventionally trained and pruned trees tend to have the lowest yields so far in this trial.
- Pruning did not affect kernel size.
- Unpruned trees did not have more mummies in January than trees pruned annually.
- Using the average grower price of almonds over the past ten years, annual pruning would have reduced net income by over $4000 per acre so far, including pruning costs and lower cumulative yields.
- Trees on Hansen are yielding less than trees on Nemaguard, probably due to less favorable soil conditions (heavy soil).