Mechanical Harvesting of California Black Ripe Table Olives

Economically Feasible Mechanical Harvesting

Harvester

- Efficient
- Fruit Quality
- Postharvest Treatments
- Decrease FRF
- Abscission Agent
- Training and Pruning

Commercially Marketable Processed Olives
2006 Results

- 86% removal
- 67% efficiency
- incompetent catch frame
- fruit accessibility
  - pruning
- fruit detachment
  - abscission

88–98%

45–54%

10–19%
California Black Ripe ‘Manzanillo’
Conclusions: 2006

- Evaluate harvester on
  - Traditional
  - Hedgerow
- Cant upper head angle
- Better padding rods, frame, belts
- Commercial scale processing
- Reevaluate delivery grade with consumer acceptability*
Rocky Hill Ranch Trials:

I. Traditional Orchard:
   - 24 X 24 diamond planting; 76 trees/a

II. Hedgerow Planting:
   - 12 X 21; 139 trees/a
2007 Harvest Season

- Traditional Pruning
- 11% efficiency
- 71% value
- 73% tree damage
Mature Hedgerow: 2007
2007 Harvest Season

- Traditional Pruning
  - 11% efficiency
  - 71% value
  - 73% tree damage

- Hedgerow Pruning
  - 81% removal
  - 73% efficiency
  - 1.5 – 2 tons/hour
  - 68 – 93% value
  - 13% tree damage
Commercial Lot Processing: 2008
53% Efficiency
Tree Training: 2001 - 2007
Coe Pistachio Shaker
ENE Prune Shaker
Abscission Trials: 2006 & 2007
Screening trials, table olives - Sept Oct 2007

Leaf loss, leaf burn, fruit burn and fruit shrivel subjective ratings:
0-no visual effect; 1-slight; 2-moderate; 3-severe

DATA OVERVIEW - Nichols Estate

- FDF (g)
  - 4% MPK 297
  - 2500 ppm ethephon 415
  - 2500 ppm ethephon + 4% MPK 99
  - 5000 ppm ethephon 151
  - 5000 ppm ethephon + 4% MPK 56
  - 0.1% RNAsi silicon adjuvant 404
  - 1X HarvestVant (40 g/L) 376
  - 0.5X HarvestVant (20 g/L) 394
  - 2 ppm 901 298
  - 1 ppm 901 264
  - 0.5 ppm 901 367
  - 2000 ppm dikegulac 1 (18.5% ai) 421
  - 4000 ppm dikegulac 1 (18.5% ai) 332
  - 2000 ppm dikegulac 2 (9.45% ai) 222
  - 4000 ppm dikegulac 2 (9.45% ai) 142
  - 2000 ppm dikegulac 3 (4.47% ai) 102
  - 4000 ppm dikegulac 3 (4.47% ai) 75
  - 0.1% dikegulac adjuvant 408

- Leaf loss
  - 0
  - 1
  - 1.5
  - 1.8
  - 2.3
  - 2.8
  - 3
  - 0
  - 0
  - 0
  - 0.8
  - 0.5
  - 0.5
  - 0.5
  - 0.3
  - 0.5
  - 0.5
  - 0

- FRT burn
  - 0.5
  - 0
  - 0
  - 0.5
  - 0.3
  - 0.3
  - 0.3
  - 0.5
  - 0.5
  - 0.5
  - 0.5
  - 0.5
  - 0.5
  - 0.5
  - 0

- % FRT drop
  - 13
  - 6
  - 42
  - 38
  - 68
  - 3
  - 0
  - 0
  - 5
  - 4
  - 5
  - 4
  - 2
  - 2
  - 2
  - 0
  - 0
  - 0
  - 0
  - 5
  - 0
  - 0
  - 15
  - 18
  - 45
  - 0
### Screening trials, table olives - Sept Oct 2007

Leaf loss, leaf burn, fruit burn and fruit shrivel subjective ratings:  
0-no visual effect; 1-slight; 2-moderate; 3-severe

### DATA OVERVIEW - Lindcove

<table>
<thead>
<tr>
<th></th>
<th>FDF (g)</th>
<th>leaf loss</th>
<th>leaf burn</th>
<th>frt burn</th>
<th>frt shvl</th>
<th>% frt drop</th>
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</thead>
<tbody>
<tr>
<td>control</td>
<td>402</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.3</td>
<td>4.0</td>
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<tr>
<td>1 ppm 901</td>
<td>125</td>
<td>1.5</td>
<td>0.0</td>
<td>0.3</td>
<td>0.3</td>
<td>6.0</td>
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<td>2 ppm 901</td>
<td>165</td>
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<td>0.3</td>
<td>0.5</td>
<td>2.0</td>
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<tr>
<td>200 ppm 589</td>
<td>362</td>
<td>0.0</td>
<td>0.0</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
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<tr>
<td>1000 ppm 589</td>
<td>408</td>
<td>0.0</td>
<td>0.0</td>
<td>0.5</td>
<td>0.0</td>
<td>7.0</td>
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<tr>
<td>2000 ppm 589</td>
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<tr>
<td>200 ppm 111</td>
<td>349</td>
<td>0.5</td>
<td>0.0</td>
<td>0.8</td>
<td>0.5</td>
<td>0.0</td>
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<tr>
<td>1000 ppm 111</td>
<td>405</td>
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<td>0.3</td>
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<td>0.5</td>
<td>0.0</td>
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<tr>
<td>2000 ppm 111</td>
<td>289</td>
<td>1.3</td>
<td>1.0</td>
<td>2.0</td>
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<td>0.0</td>
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<tr>
<td>5 mM TIBA + 5000 ppm ethephon</td>
<td>182</td>
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<td>0.5</td>
<td>0.0</td>
<td>28.0</td>
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<tr>
<td>5 mM TIBA + 7500 ppm ethephon</td>
<td>138</td>
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<td>0.0</td>
<td>0.5</td>
<td>0.0</td>
<td>23.0</td>
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<td>5 mM TIBA</td>
<td>387</td>
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<td>5000 ppm ethephon</td>
<td>225</td>
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<td>45.0</td>
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<td>7500 ppm ethephon</td>
<td>49</td>
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<td>47.0</td>
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<tr>
<td>5 mM 2-NAA</td>
<td>394</td>
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<td>0.3</td>
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<tr>
<td>5 mM 2-NAA + 5000 ppm ethephon</td>
<td>215</td>
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<td>1.0</td>
<td>0.3</td>
<td>23.0</td>
</tr>
<tr>
<td>5 mM 2-NAA + 7500 ppm ethephon</td>
<td>132</td>
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<td>1.0</td>
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<td>48.0</td>
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<tr>
<td>5 mM CPMPA</td>
<td>372</td>
<td>0.3</td>
<td>0.0</td>
<td>0.8</td>
<td>0.3</td>
<td>0.0</td>
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<tr>
<td>5 mM CPMPA + 5000 ppm ethephon</td>
<td>177</td>
<td>2.5</td>
<td>0.0</td>
<td>0.8</td>
<td>0.3</td>
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<tr>
<td>5 mM CPMPA + 7500 ppm ethephon</td>
<td>68</td>
<td>2.8</td>
<td>0.0</td>
<td>0.8</td>
<td>0.3</td>
<td>66.0</td>
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<tr>
<td>control</td>
<td>383</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.3</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Applications Sept 28 & 29 - measurements October 9 & 10, 2007

DATA OVERVIEW - Lindcove
Poman, Catamarca, Argentina
February 11th – 28th, 2008
Hand Harvest  24 hours  Machine Har
2008 Finca La Bella Harvest

- 750 PPM Ethephon 4% MPK+ 25% Adj.
- FDF @ 10 days
  - .400 kg vs .500 kg
- Leaf loss: 1.78 on 3 scale
- No effect on harvest efficiency
  - Equal fruit removal%

- MaqTec Efficiency*
  - 99% removal
  - 90% efficiency
    - 10% ground
  - 24-30 seconds/tree
  - Mild limb damage
  - 100% fruit damage
    - severe

- * 3.5 tons/a
Conclusions: Objective 1

- Evaluate all existing harvesters
  - Colossus
  - OMC
  - Coe Double Sided Shaker
  - ENE Double Sided
  - Wraparound Shaker

- Evaluate Efficiency:
  - % Removal
  - % Final
  - Seconds per tree, minutes per ton

- Commercially Acceptable Fruit Quality
Conclusions: Objective II

- Develop Tree Pruning for Mechanical Harvesting (current orchards)
  - Skirting
  - Topping
  - Hedging

- Develop New Orchards
  - Hedgerow
  - Trellised
Conclusions: Objective III

- Screen and Test Antioxidant Treatments
  - preharvest
  - postharvest
- Investigate Fruit Handling
  - Field brine(?)
Conclusions: Objective IV

- Evaluate Abscission Agents
  - ERCs + / - MPK and MP
  - Other promising compounds
    - Branch tests
    - Whole Tree Trials
      - Colossus
Final Objective:

- **Economic Net Return**
  - Harvesting Cost
    - Machine harvesting cheaper
  - Yield
    - Pruning may reduce
  - Harvester Efficiency
    - Won’t remove all olives
  - Fruit Quality
    - May need to adjust receiving station grading
Questions?

Groups.ucanr.edu/olive_harvest
To develop mechanical harvesting for the California table olive industry.

This site presents the following: current research; project proposals and reports; project investigators; industry cooperators, and field days and meetings.

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