Session Nine
Fruit size and production

New Zealand and Australia Avocado Grower’s Conference’05
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Mulching – is it worth it?

A Sustainable Farming Fund project in association with Perry Environmental Ltd and Living Earth Ltd

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Avocado Industry Council Ltd
Introduction

• Mulching is widely regarded as a worthwhile management practice as it:
  • improves yield
  • maintains soil moisture
  • improves root numbers & function

• The negatives are:
  • hard to get a reliable supply
  • becoming expensive
  • impact on fertilizer availability
Introduction

• Utilize greenwaste as a reliable supply of mulch
• Greenwaste companies [Living Earth Ltd and Perry Environmental Ltd]
• Waste material from their composting operations
• Increasing supply of greenwaste
• Greenwaste products are: compost, compost tailings, pasteurized but uncomposted greenwaste
Introduction

Asked four questions:

• What should the mulch be made of?
• How much should be applied?
• Where should mulch be applied?
• When should mulch be applied?
Introduction

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• Where should mulch be applied?
• When should mulch be applied?
Experimental

- 5 orchards
- 100 mm thickness
- 1 m wide band centered on the drip line
- Treatments applied to randomly selected trees
- Trees similar size and shape
- 5 trees per treatment
- 7 mulch treatments
Experimental

Mulch treatments were:

- Minimal mulch – regular removal of mulch
- Leaf litter – accumulation
- Compost
- 10 day greenwaste
Experimental

Mulch treatments were:

• Bark + 20% compost

• Post peelings

Controls:- minimal mulch, leaf litter, post peelings
Measurements

- Shoot growth
- Trunk circumference
- Weed cover
- Yield
- Soil moisture
- Roots
- Mulch breakdown
- Minerals
Shoot growth

![Graph showing the increase in shoot length (%)]

- 2003-2004
  - Min Mulch
  - Leaf litter
  - Compost
  - 10 day greenwaste
  - Bark + compost
  - Tailings
  - Post peelings
- 2004-2005
  - Min Mulch
  - Leaf litter
  - Compost
  - 10 day greenwaste
  - Bark + compost
  - Tailings
  - Post peelings

The graph illustrates the increase in shoot length (%) for different treatments over two years.
Trunk circumference

![Graph showing the increase in trunk circumference over 3 years for different treatments: Min Mulch, Leaf litter, Compost, 10D GreenW, Bark+Comp, Tailings, and Post peelings. The graph indicates that Compost and 10D GreenW show the highest increase, while Min Mulch shows the lowest.](image)
Soil moisture

9/1/2003

14/1/2004

Tensiometer reading (-kPa)

30 cm

60 cm
Weeds

- Min Mulch
- Leaf litter
- Compost
- 10 day greenwaste
- Bark + compost
- Tailings
- Post Peelings

Weed cover (%)
Yield

• Third harvest in 2005/06 season
• 2003/04 and 2004/05 low crop years
• 2004/05 harvest suggest compost and post peelings had highest yields
  -but off a very low yield base
• Reserve judgment until after final harvest
Roots

Root coverage at the soil mulch interface (%)

- Min Mulch
- Leaf litter
- Compost
- 10 Day greenwaste
- Bark+comp
- Tailings
- Post peelings
Mulch breakdown

<table>
<thead>
<tr>
<th>Material</th>
<th>Time to halve mulch depth (1st year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compost</td>
<td>0.0</td>
</tr>
<tr>
<td>10 day greenwaste</td>
<td>0.5</td>
</tr>
<tr>
<td>Bark+comp</td>
<td>1.0</td>
</tr>
<tr>
<td>Tailings</td>
<td>1.5</td>
</tr>
<tr>
<td>Post peelings</td>
<td>2.0</td>
</tr>
</tbody>
</table>
## Minerals

Mineral composition as kg per m³. Mn, Zn, Cu, B are g per m³

### Mulch material

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Compost</th>
<th>10 Day greenwaste</th>
<th>Bark +compost</th>
<th>Tailings</th>
<th>Post peeling</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>8.1-6.8</td>
<td>3.8-3.2</td>
<td>5.1-3.4</td>
<td>5.1-4.8</td>
<td>1.0-0.2</td>
</tr>
<tr>
<td>P</td>
<td>2.5-2.1</td>
<td>0.7-0.4</td>
<td>1.2-0.9</td>
<td>2.3-2.1</td>
<td>0.07-0.03</td>
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<tr>
<td>S</td>
<td>1.4-1.1</td>
<td>1.0-0.4</td>
<td>0.8-0.6</td>
<td>1.4-1.2</td>
<td>0.09-0.03</td>
</tr>
<tr>
<td>K</td>
<td>4.3-1.6</td>
<td>2.3-0.7</td>
<td>3.4-0.7</td>
<td>4.9-1.9</td>
<td>0.8-0.1</td>
</tr>
<tr>
<td>Ca</td>
<td>17.3-13.1</td>
<td>6.2-4.7</td>
<td>10.2-8.9</td>
<td>9.5-9.2</td>
<td>0.7-0.2</td>
</tr>
<tr>
<td>Mg</td>
<td>1.8-1.7</td>
<td>1.5-0.8</td>
<td>1.3-0.8</td>
<td>1.3-1.1</td>
<td>0.2-0.08</td>
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<td>Na</td>
<td>0.9-0.2</td>
<td>0.4-0.2</td>
<td>0.7-0.02</td>
<td>1.1-0.05</td>
<td>&lt;0.01</td>
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<tr>
<td>Fe</td>
<td>5.5-4.2</td>
<td>3.9-1.8</td>
<td>1.7-1.7</td>
<td>2.7-1.6</td>
<td>0.2-0.15</td>
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<tr>
<td>Mn</td>
<td>217-193</td>
<td>156-72</td>
<td>122-119</td>
<td>194-136</td>
<td>22-18</td>
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<td>Zn</td>
<td>114-91</td>
<td>85-42</td>
<td>110-49</td>
<td>122-59</td>
<td>9-3</td>
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<td>Cu</td>
<td>39-29</td>
<td>28-8</td>
<td>35-11</td>
<td>37-14</td>
<td>2-1</td>
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<tr>
<td>B</td>
<td>15-8</td>
<td>7-6</td>
<td>12-7</td>
<td>10</td>
<td>3-0</td>
</tr>
</tbody>
</table>
Minerals

• Only soil P, K, Mg and B showed differences
• Present at higher amounts in the soil under mulches
• Not reflected in leaf mineral content
• Probably reflect orchard fertilizer programme and soil moisture
• Expect mulches to release nutrients slowly depending on soil biological activity
Minerals

Soil Potassium (me/100g)

- Min Mulch
- Leaf litter
- Compost
- 10 day greenwaste
- Bark+compost
- Tailings
- Post peelings

2004

2005
Biological activity

Average number of worms in 15cm x 15 cm of soil

- Min Mulch
- Leaf Litter
- Compost
- 10 day greenwaste
- Tailings
- Post peelings

[Graph showing biological activity]
Summary

Mulches:

• led to a tendency for greater trunk growth
• can increase the amount of roots
• can increase the amounts of some minerals in the soil
• some are effective slow release fertilizers
• are not a substitute for irrigation
• improve soil biological activity
Is there a payback for mulching?

• Yes but it is long term and not easy to quantify
• An improved root environment and root numbers should help with productivity
• May be a useful management tool to change the soil environment
  • e.g. increasing soil biological activity may mean applying a mulch with some compost
• Other factors appear to have more influence on the tree than mulch, e.g. alternate bearing cycle, fertilizer programme
Acknowledgements

Growers, packhouses, SFF etc