BIOCHAR

as a soil amendment

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TIA is a joint venture of the University of Tasmania and the Tasmanian Government
Biochar to the Rescue

- Reduce soil acidity
- Increase soil moisture
- Increase water retention
- Improve soil structure
- Increase number of beneficial soil microbes
- Stimulates soil microorganisms
- Increase productivity and crop yields
- Reduced leaching of nitrogen into ground water
- Reduce fertiliser use

Biochar can improve almost any soil.


http://www.biochar-international.org/biochar/faqs
What is biochar?

Biochar: charcoal resulting from heating of biomass in an oxygen-limited environment.
**Trial Description**

Location: Mountain River, Tasmania  
Cultivar: Fuji (Naga-Fu 2)/M26  
(with Royal Gala interstem)

**Treatments:**

i. control (untreated)  
ii. biochar 47 t/ha or 5 kg /tree  
iii. compost 10 t/ha  
iv. biochar + compost

Biochar produced from the wood wastes of *Acacia* sp. produced at 550 ° C  
(sourced from Pacific Pyrolysis, NSW)
## Tree growth

<table>
<thead>
<tr>
<th></th>
<th>No. of fruit cm(^{-2}) TCSA*</th>
<th>Yield efficiency (kg cm(^{-2}) TCSA)</th>
<th>Average fruit weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2013</td>
<td>2012</td>
</tr>
<tr>
<td>Control</td>
<td>8.69</td>
<td>7.10</td>
<td>1.46</td>
</tr>
<tr>
<td>Biochar</td>
<td>9.88</td>
<td>8.13</td>
<td>1.82</td>
</tr>
<tr>
<td>Compost</td>
<td>8.45</td>
<td>6.89</td>
<td>1.54</td>
</tr>
<tr>
<td>B+C</td>
<td>7.37</td>
<td>6.72</td>
<td>1.35</td>
</tr>
</tbody>
</table>

### 2-way ANOVA

<table>
<thead>
<tr>
<th></th>
<th>Biochar</th>
<th>Compost</th>
<th>B X C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield</td>
<td>Not Significant</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Yield efficiency</td>
<td>Not Significant</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>No of fruit</td>
<td>Not Significant</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Fruit weight</td>
<td>Not Significant</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Blossom density</td>
<td>Not Significant</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
</tbody>
</table>

No effect on...
- Yield
- Yield efficiency kg /cm\(^2\)
- No of fruit
- Fruit weight
- Blossom density

Sig. increase in stem girth

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Tree Physiology

No significant effect on
- total leaf area
- photosynthetic capacity
- leaf nutrient concentration
- daily tree water use (sap flow)
- gas exchange

Leaf water potential (Mpa)

- Biochar Pre-dawn
- Control Pre-dawn
- Biochar Midday
- Control Midday

Nov  Dec  Feb  Mar  Apr

-3 -2.5 -2 -1.5 -1 -0.5 0

Soil Water and Porosity

No significant effect on:
• Field capacity
• Permanent wilting point
• Plant available water
• Soil moisture
• Aggregate stability
• Mesoporosity & Microporosity

Significantly:
• Reduced bulk density
• Increased total porosity
• Increased saturated water content.

SEM of Acacia green waste

Large pores created by worms

Soil Carbon and Acidity

- Both organic amendments increased soil C
- Biochar decreased rate of potential N mineralisation

**Acidity**
- Biochar pH $1:5 \text{CaCl}_2$ 6.40
- Unusual most are alkaline

After 20 months
- Control pH $1:2.5 \text{KCl}$ 6.14
- Biochar pH $1:2.5 \text{KCl}$ 5.61
Biochar significantly increased
- Phosphorous Concentration
- Phosphorous leaching
- Potassium Leaching
(Nitrogen 51% increase – not significant)

Biochar resulted in significantly more water moving through the soil profile.....worms

Hardie, et. al., (accepted) Effect of Biochar on Nutrient Leaching in a Young Apple Orchard. Journal of Environmental Quality
Changes in bacterial diversity - not significant or modest
Shift in the type of microbes in each treatment

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Biochar to the Rescue

- No Reduce soil acidity
- No Increase soil moisture
- No Increase water retention
- Yes Improve soil structure
- No Increase number of beneficial soil microbes
- Yes Stimulates soil microorganisms
- No Increase productivity and crop yields
- No Reduced leaching of nitrogen into ground water
- No Reduce fertiliser use

Biochar can improve almost any soil.

At the Mt Creek Site: Loamy Sand, Kurosol, Acacia Greenwaste Biochar, High Input System
Biochar to the Rescue

- Reduce soil acidity: No
- Increase soil moisture: No
- Increase water retention: No
- Improve soil structure: Yes
- Increase number of beneficial soil microbes: No
- Stimulates soil microorganisms: Yes
- Increase productivity and crop yields: No
- Reduced leaching of nitrogen into ground water: No
- Reduce fertiliser use: No

Biochar can improve almost any soil.

If it was a Low Input: low fertiliser and irrigation system would it have worked...????

Some biochars in some soils probably do work but not this biochar, at this site......
Acknowledgements

Thanks to a great team

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