The role of TwinN, a microbial bio-fertiliser in avocado production

VII Avocado Congress
Cairns, 2011
What is a microbial bio-fertiliser?
¿Que es un bio-fertilizante microbiano

• A product that contains beneficial microbes
Un producto que contiene microbios beneficiosos

• Can be freeze dried or a liquid formulation
Puede ser liofilizado o liquido

• Consistent quality of product is important for commercial avocado growers
Calidad consistente es importante para productores de aguacate comercial

Mapleton Agri Biotec
How do the microbes in bio-fertilisers work?

¿Cómo los microbios en bio-fertilizantes trabajan?

• Microbes fix atmospheric nitrogen into the tree roots and leaves

\[ N_2 + 8H^+ + 6e^- + 16ATP = 2NH_3 + H_2 + 16 ADP \]

Las bacterias bijan nitrógeno atmosférico en las raíces y ojas de la planta

• Microbes produce auxins that promote root growth

Los microbios producen auxinas que promueven el crecimiento de las raíces

• Microbes improve soil/root health

Los microbios mejoran la salud de el suelo y raíces

Mapleton Agri Biotec
Wheat (Trigo) – Western Cape, South Africa - 2010

Independent registration trial

100% N = 112 kg/ha
50% N = 56 kg/ha
# Leaf N levels in citrus (Naranjas) & mango - South Africa

## Citrus in RSA:

<table>
<thead>
<tr>
<th>Client</th>
<th>2009 (- TwinN)</th>
<th>2010 (+ TwinN)</th>
<th>N leaf analyses norms (RSA):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piet Engelbrecht Drip</td>
<td>2.4</td>
<td>2.57</td>
<td>Delta (small fruit) 2.1-2.3</td>
</tr>
<tr>
<td>PLM</td>
<td>1.92</td>
<td>2.5</td>
<td>Lemon (oil) 2.2-2.6</td>
</tr>
<tr>
<td>Schoonbee</td>
<td>1.82</td>
<td>1.97</td>
<td>Midknight Val 2.3-2.6</td>
</tr>
<tr>
<td>Petrus Berg Groep 1</td>
<td>2.34</td>
<td>2.55</td>
<td>Navel 2.6-2.8</td>
</tr>
<tr>
<td>Bosveld Midknights</td>
<td>2.56</td>
<td>2.4</td>
<td>Delta (Large fruit) 2.3-2.6</td>
</tr>
<tr>
<td></td>
<td>2.35</td>
<td>2.4</td>
<td>Grapefruit 2.1-2.4</td>
</tr>
<tr>
<td></td>
<td>2.39</td>
<td>2.35</td>
<td>Midseasons 2.1-2.3</td>
</tr>
<tr>
<td></td>
<td>2.62</td>
<td>2.35</td>
<td>Young trees 2.3-2.6</td>
</tr>
<tr>
<td></td>
<td>2.36</td>
<td>2.13</td>
<td>Soft citrus 2.2-2.6</td>
</tr>
<tr>
<td></td>
<td>2.32</td>
<td>2.36</td>
<td>Mango 1.1 - 1.3</td>
</tr>
<tr>
<td>Bruwer LRochelle Afourer</td>
<td>3.07</td>
<td>2.41</td>
<td>- 2009 data is pre TwinN</td>
</tr>
<tr>
<td></td>
<td>2.01</td>
<td>2.16</td>
<td>- 2010 data is after ~20% N</td>
</tr>
<tr>
<td></td>
<td>2.49</td>
<td>2.45</td>
<td>reduction + TwinN</td>
</tr>
<tr>
<td></td>
<td>1.57</td>
<td>2.05</td>
<td>- In blocks with excess</td>
</tr>
<tr>
<td></td>
<td>2.13</td>
<td>2.18</td>
<td>leaf N the N reductions</td>
</tr>
<tr>
<td>MEstherhuizen</td>
<td>2.28</td>
<td>2.1</td>
<td>were larger</td>
</tr>
<tr>
<td></td>
<td>1.83</td>
<td>1.91</td>
<td></td>
</tr>
</tbody>
</table>

**Total Average:** 2.20 2.22

## Mangoes in RSA:

| BMW Grovedale                    | 0.87           | 0.97           |                             |
How much do avocado growers cut their N fertiliser?
¿Cuánto Nitrogeno reducen los productores de aguacate

- Cut N by 25 – 50% but not more than 50 U of N/ha
  Reducen de un 25 a 50% pero no mas de 50 U de N/ha
- Apply in spring and autumn to moist root zone
  Aplicar en primavera y otoño a la zona radicular humeda
- Organic growers need to supply N by mulch/manure as well as from a bio-fertiliser
  Productores organicos necesitan el aporte de N por abono/
estiércol así como de un bio-fertilizante

Mapleton Agri Biotec
• TwinN soil application 2 months previous
Aplicación de TwinN dos meses antes
• Perspex windows to monitor root growth
Perspex ventanas para controlar el crecimiento de raíces
• Avocado Australia trial
Demostracion de en Australia Aguacate
Microbial biofertilisers can reduce root disease pressure
Los microbios pueden reducir la presión de enfermedades en la raíz

- Soybean (soja) – Illinois – US Department of Ag trial, 2008 (repeated in 2009)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Fusarium root colonisation</th>
<th>Root pseudomonads (beneficial) (beneficiosa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No herbicide</td>
<td>67.5 a</td>
<td>116.9 a</td>
</tr>
<tr>
<td>+ Roundup</td>
<td>106.4 b</td>
<td>28.2 b</td>
</tr>
<tr>
<td>+ TwinN + Roundup</td>
<td>64.0 a</td>
<td>80.0 a</td>
</tr>
<tr>
<td>LSD (0.05)</td>
<td>19.2</td>
<td>62.9</td>
</tr>
</tbody>
</table>

- Increased beneficial microbes
  Incremento de microbios beneficiosos

- Decreased *Fusarium solani* infection
  Disminución de infección por *Fusarium solani*
**Lupin baiting tests for *Phytophthora cinnamomi***

Performed by DEEDI QLD

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% Mortality 10/3/10</th>
<th>Chlamydospore counts 14/7/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Farm Practice</td>
<td>66.7</td>
<td>2.34</td>
</tr>
<tr>
<td>Twin N every 3 months + 50% N</td>
<td>46.7</td>
<td>Not tested</td>
</tr>
<tr>
<td>Twin every 6 weeks + 25% N</td>
<td>40.0</td>
<td>0.56</td>
</tr>
</tbody>
</table>

**Direct TwinN effect or reduced N?**

¿Efecto directo de TwinN o N reducido
## Avocado Australia trial results

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. of fruit</th>
<th>Yield (kg/tree)</th>
<th>Av. Fruit wt. (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grower treatment</td>
<td>248</td>
<td>68.5</td>
<td>277</td>
</tr>
<tr>
<td>TwinN foliar standard N</td>
<td>277</td>
<td>75.2</td>
<td>273</td>
</tr>
<tr>
<td>TwinN soil standard N</td>
<td>251</td>
<td>69.8</td>
<td>279</td>
</tr>
<tr>
<td>TwinN foliar reduced N</td>
<td>297</td>
<td>80.7</td>
<td>272</td>
</tr>
<tr>
<td>TwinN soil reduced N</td>
<td>259</td>
<td>72.2</td>
<td>287</td>
</tr>
<tr>
<td>Stat. significance</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
</tbody>
</table>

- Trial ran for 12 months (harvested Aug 2011 and trial is ongoing)
- Tested reduced N rates
- Tested Twin *foliar* versus *soil* drench
- High variability in yield data makes statistical significance difficult to achieve
- TwinN yields were all higher than grower treatment (trend)
- Reduced N did not reduce yields in TwinN treated trees
- Longer term benefits on tree health will be measured in Year 2

**Trial by J Leonardi, Avocado Australia**
Conclusion

Microbial biofertilisers can help avocado growers by:

Bio-fertilizante microbiano puede ayudar a los productores de aguacate en:

- Reducing nitrogen costs
  Reduccion del costo de Nitrogeno
- Increasing root vigour
  Incremento de masa radicular y vigor en la raíz
- Improving root/soil health
  Mejorar la salud del suelo y la raiz

Appreciation to Avocado Australia for trials and advice
Thank you

Gracias