Session Four
New germplasm and global breeding programmes

New Zealand and Australia Avocado Grower’s Conference’05
20-22 September 2005
Tauranga, New Zealand
First avocado seeds imported into South Africa just over 100 years ago
First importation of budwood of specific cultivars from USA in the mid 1920’s by Dr Hans Merensky

Dr Merensky in one of the Westfalia avocado orchards (circa 1940)
## Cultivars and yield of avocados grown at Westfalia Estate 1967

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Origin</th>
<th>Yield (tons) 1967</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaheim</td>
<td>California</td>
<td>1.0</td>
</tr>
<tr>
<td>Dickey ‘A’</td>
<td>California</td>
<td>-</td>
</tr>
<tr>
<td>Edranol</td>
<td>California</td>
<td>2.5</td>
</tr>
<tr>
<td>Hass</td>
<td>California</td>
<td>5.0</td>
</tr>
<tr>
<td>Ryan</td>
<td>California</td>
<td>5.0</td>
</tr>
<tr>
<td>Collinson</td>
<td>Florida</td>
<td>5.0</td>
</tr>
<tr>
<td>Lula</td>
<td>Florida</td>
<td>2.5</td>
</tr>
<tr>
<td>Itzamna</td>
<td>Guatemala</td>
<td>15.0</td>
</tr>
<tr>
<td>Linda</td>
<td>Guatemala</td>
<td>0.5</td>
</tr>
<tr>
<td>Fuerte</td>
<td>Mexico</td>
<td>70.0</td>
</tr>
<tr>
<td>Hamaboya</td>
<td>South Africa</td>
<td>1.0</td>
</tr>
<tr>
<td>Lydia</td>
<td>South Africa</td>
<td>1.0</td>
</tr>
<tr>
<td>Makaya</td>
<td>South Africa</td>
<td>1.0</td>
</tr>
<tr>
<td>Westfalia 1-3</td>
<td>South Africa</td>
<td>1.5</td>
</tr>
</tbody>
</table>
South African avocado tree sales for the 2003 – 2004 season
(Source: Avocado Nursery Association of South Africa)
Avocado cultivar breeding

- Presently, industry focus on Hass (-types)
- Impossible to predict future market preferences (e.g. size, shape, colour)
- No early screening mechanism for seedlings (long juvenile phase, high level of heterozygosity, unpredictable hybrids)
- Long term, expensive
Avocado cultivar evaluation at WTS

Parameters monitored

- Time of maturation
- Yield
- Fruit size distribution
- Taste
- Fruit quality
### Evaluation of new Hass-like avocado cultivars at WTS

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Yield (t/ha)</th>
<th>Count Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1999</td>
<td>2000</td>
</tr>
<tr>
<td>Harvest</td>
<td>29.2</td>
<td>37.0</td>
</tr>
<tr>
<td>Gem</td>
<td>11.4</td>
<td>28.2</td>
</tr>
<tr>
<td>Hass</td>
<td>2.8</td>
<td>20.0</td>
</tr>
</tbody>
</table>

1 extrapolated to 200 trees/ha
2 based on a 4kg carton

Avocado rootstocks

The devastation caused by P.c. in avocado orchards in many countries resulted in research focusing on finding resistant or tolerant rootstocks.
Avocado rootstock breeding at WTS

- Clear aim: tolerance to P.c. root rot and high yield
- Advantage: Early screening mechanism for P.c.
- Long term project with long term benefit
- Expensive, however less land required than for scion cultivar screening
Avocado rootstock breeding & screening at WTS

Breeding Block

Screening of seedlings in P.c. infested substrate
Results after 6 weeks of P.c. exposure

Healthy seedling selections cloned
Rootstock evaluation at WTS

- Over 30 clonal rootstock selections evaluated
- Origin of rootstocks:
  - imported plant material
  - SA rootstocks of survivor & super trees
  - selections from WTS Breeding & Selection Program
- 25% of evaluated rootstocks originate from Westfalia
WTS rootstock evaluation orchard
(high P.c. pressure, no treatment)
Rootstock field evaluation

- 24 to 30 trees/rootstock planted in randomised block design
- All trees grafted to Hass
- Initially Duke 7 used as control, now Dusa
- Evaluated for minimum of 6 years (yield, tree condition)

WTS rootstock evaluation block 2
Stages of root rot decline according to 0 – 10 scale
WTS Block 2: planted 1998
Tree condition & Hass yields (cum 6 years)
WTS Block 3: planted 2000
Tree condition & Hass yields (cum 4 years)

Cumulative yield (kg/tree)

Best selection: 45 kg/tree
Duke 7: 25 kg/tree
Edranol seedling: 15 kg/tree

Tree condition (0-10)
Other observations

- Propagation
- Compatibility with Hass
- Susceptibility to diseases, e.g. stem canker caused by *Phytophthora sp.*
Commercial evaluation of rootstocks at Westfalia Estate

Data trees:
- Hass on Dusa
- Hass on Duke 7

Planted: Late 2002
First small crop: 2004
Commercial rootstock evaluation: Yield 2005

Unpublished data, T. Bruwer, WTS (2005)
New plantings in South Africa: Hass on Dusa
Avocado tree sales of Westfalia Nursery

Clonal rootstocks

Seedling rootstocks

Duke 7

Dusa™

Ryan

Hass

Fuerte

Lamb

Hass

Ryan

Hass

Lamb

Hass

Ryan

Hass

Lamb

Hass

Ryan

Hass

Lamb

Hass

Ryan

2003

2004

2005
California

❖ Dusa rootstock patented in USA after extensive field trials conducted by Prof. John Menge
❖ Released to Californian avocado growers in 2004
❖ Extensive re-plantings of Hass on Dusa
Re-planting site in California: Hass on Dusa
Australia & New Zealand

- Australia: initial plantings on Dusa undertaken 2004, larger scale plantings 2005.
- New Zealand: Dusa presently in quarantine, release pending to NZAIC
Conclusions

 пытались

 We trust that the superior results achieved with Dusa in South Africa and California will be repeated in Australia and New Zealand.

 Not only have we, through selection and thorough testing, released a proven superior rootstock, Dusa, but we are striving to assist the avocado industry with even better alternatives.

 Presently WTS has 15 new clonal rootstocks under field evaluation at Westfalia Estate.

 We look forward to sharing our exciting breakthroughs with you in the future.
Acknowledgements

Joe Darvas

Robbie Maddison

Jan Toerien

Sylvie Kremer-Köhne

Anita Willis

Lawrence Mukhomo