Australian Rootstock Program
Update 09

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HAL Know-how for Horticulture™

SHS SERVICING HORTICULTURE

Rootstocks in Fruit Crops

- Protection against root diseases
- Dwarfing
- Yield increases
- Improved fruit quality
- Nematode resistance
- Chloride tolerance

The Modern Avocado Tree

Consists of two genetic entities:

- **Root system**
- **Fruiting scion top**

Horticultural vs Physiological Graft Compatibility

Three botanical races – Mexican
Guatemalan
West Indian

Horticultural graft compatibility

Physiological graft incompatibility

Effect of Graft Union on Root Growth

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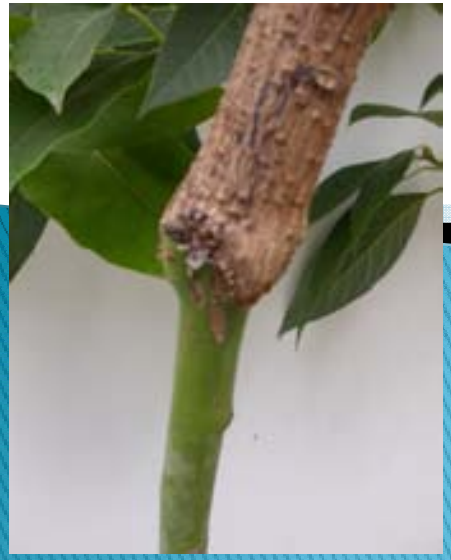

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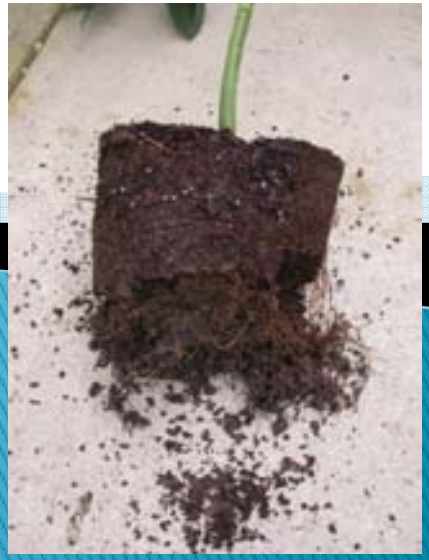


Rootstock Influence on Tree Physiology

- **‘Velvick’ has twice the leaf diene conc. of ‘Duke 6’ and is translocated to the Hass scion Coates *et al.* 2003**

- **Rootstocks change mineral nutrition profiles in fruit Coates *et al*. 2003**

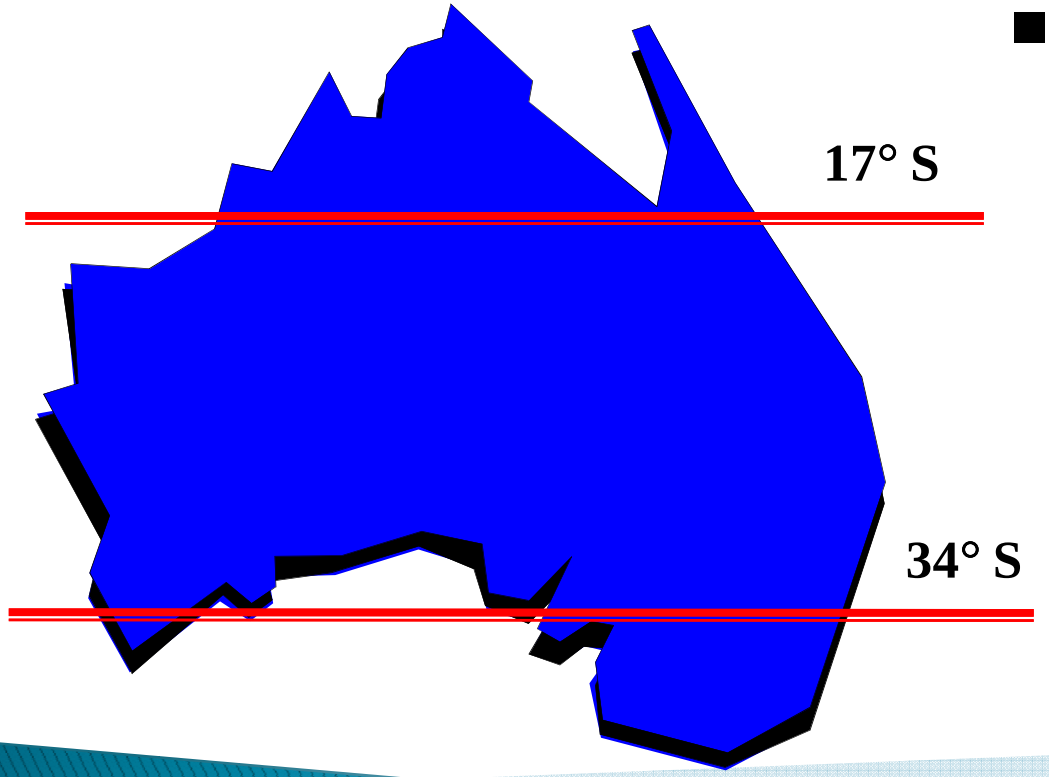
Rootstock Influence on Phytophthora RR

- **‘Duke 7’ as a rootstock improved survival over ‘Topa Topa’ rootstock when grafted to Hass Zentmyer *et al*. 1960’s**

Rootstock Influence on Yield

- **Rootstocks influenced yield of avocado Mickelbart *et al*. 2007**

Project Opportunities



- **Greatest environmental diversity**
  - **Climate**
  - **Soil**
  - **Water (quality)**

Project Objectives

- **Evaluate rootstocks from the three botanical races grafted to Hass and Shepard**

Project Objectives

- **Evaluate rootstocks from the three botanical races grafted to Hass and Shepard**
- **Evaluate both seedling and clonally propagated rootstocks from the same maternal source**

Seedling vs. Clonal Rootstocks

- High relative cost of nursery trees on cloned rootstocks
- Strong evidence required to shift industry to cloned material

Project Objectives

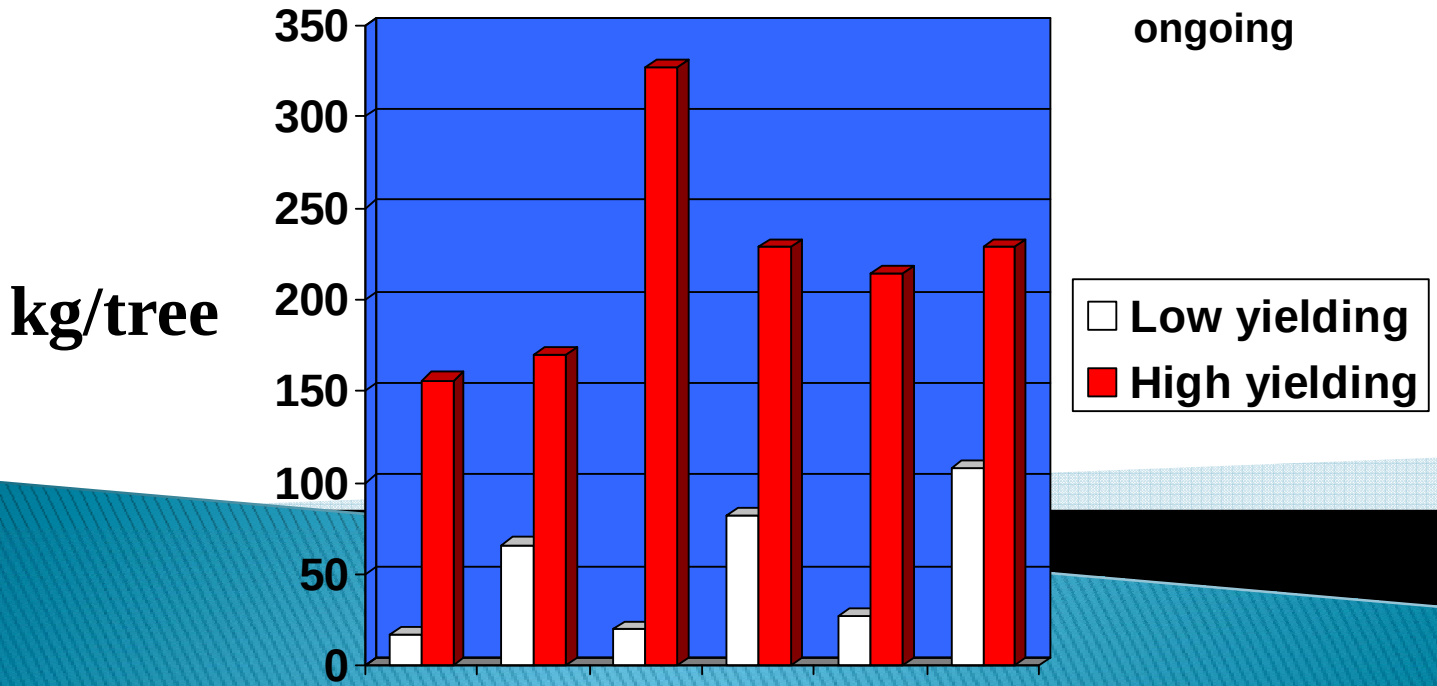
- Evaluate rootstocks from the three botanical races grafted to Hass and Shepard
- Evaluate both seedling and clonally propagated rootstocks from the same maternal source
- **Identify and evaluate superior rootstocks for consistent high yield and root rot tolerance**

Project Objectives

- **Identify and evaluate superior rootstocks for consistent high yield**

1st cloned lines to crop 09/10

Identification and recovery ongoing



Source: Thomas (1997) Aust. Avocado Conf. Proc.

Project Objectives

- **Identify, recover and evaluate superior rootstocks for root rot resistance**

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One-year-old cloned SHSR-04 rootstock grafted to Hass

Project Objectives

- **Evaluate the effect of rootstock on postharvest disease development in fruit**

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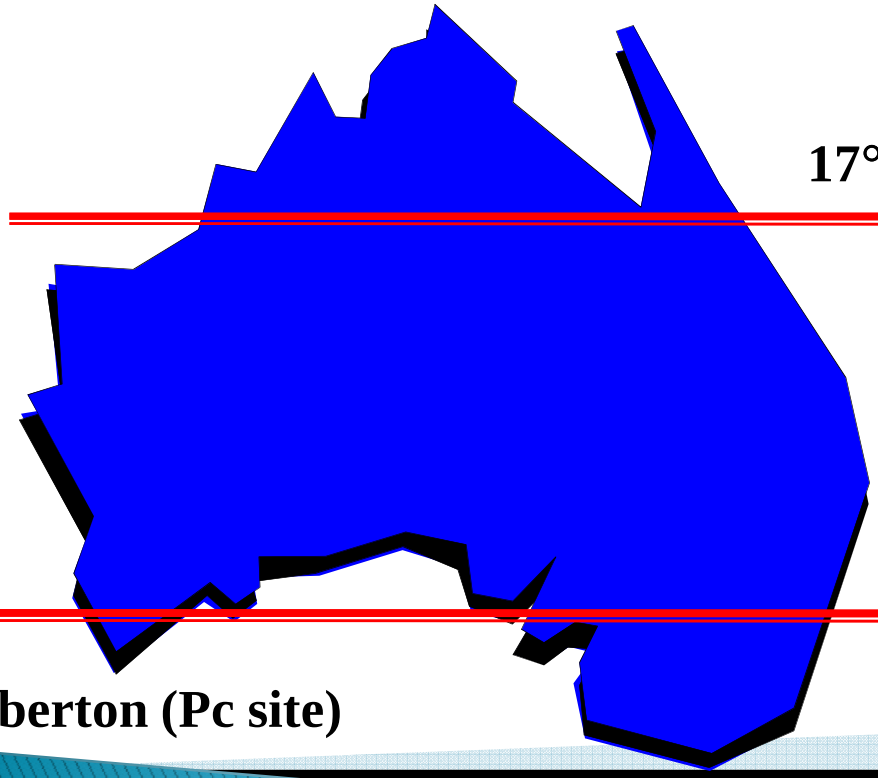
- **Evaluate the effect of rootstock on postharvest disease development in fruit**

- **Evaluate the effect of rootstock on postharvest storage and physiological fruit disorders**

Experimental sites



Results

Yield and Production Efficiency

Hass on Seedling Rootstocks at Walkamin, QLD

Rootstock	Yield 09 (kg/tree)	YE (kg/m^3)	Cumulative Yield 07-09
A8	**24.6**	**2.0**	36.2
A10	**24.0**	1.2	36.9
Barr Duke	21.6	1.1	40.1
Duke 7	9.2	1.3	18.7
Nabal	10.5	1.2	**45.0**
Reed	8.5	0.7	28.5
Rigato	21.6	1.9	20.2
SHSR-02	**25.9**	0.7	**43.4**
Velvick^D	**27.0**	**1.4**	**53.7**
Zutano	23.2	1.3	40.7

Yield and Production Efficiency

Hass on Cloned Rootstocks at Walkamin, QLD

Rootstock	Yield 09 (kg/tree)	YE (kg/m^3)	Cumulative Yield 07-09
A8	**18.2**	**1.8**	27.0
A10	**17.0**	**0.9**	27.8
Barr Duke	9.2	0.7	13.5
Duke 7	8.9	1.1	**21.0**
Hass	7.6	0.4	13.4
Nabal	2.1	0.7	2.9
Reed	7.0	0.7	10.3
Thomas	9.5	**0.5**	22.5
Velvick^{CP}	**12.3**	**0.5**	**23.3**
Zutano	13.6	1.0	**21.4**

Yield and Production Efficiency

Shepard on Seedling Rootstocks at Walkamin, QLD

Rootstock	Yield 09 (kg/tree)	YE (kg/m^3)	Cumulative Yield 07-09
A8	**53.3**	**1.8**	68.0
A10	20.0	1.2	33.4
Duke 7	28.1	1.5	46.5
Nabal	38.6	1.7	65.3
Reed	33.0	1.8	48.2
SHSR-02	**54.1**	**2.2**	**69.9**
SHSR-03	37.8	1.6	51.0
Velvick^D	34.6	1.3	**69.7**
V1	**47.4**	1.6	**73.1**
Zutano	30.6	2.6	46.7

Yield and Production Efficiency

Shepard on Cloned Rootstocks at Walkamin, QLD

Rootstock	Yield 09 (kg/tree)	YE (kg/m^3)	Cumulative Yield 07-09
A10	**36.6**	1.6	48.1
Barr Duke	22.3	1.4	31.3
Duke 7	5.1	1.3	9.6
Nabal	12.3	**2.1**	14.8
Shepard	**31.8**	1.6	**53.8**
SHSR-03	28.9	**1.8**	49.0
Thomas	**42.0**	1.3	**60.0**
Velvick^{CP}	**34.9**	**1.9**	**51.1**
Zutano	28.6	1.8	39.4

Yield and Production Efficiency

Hass on Seedling Rootstocks at Goodwood (Childers), QLD

Rootstock	Yield 09 (kg/tree)	YE (kg/m^3)	Cumulative Yield 07-09
A8	**88.0**	2.5	**144.4**
A10	66.2	2.3	113.9
Nabal	64.8	2.4	121.7
Peasley	76.2	2.3	125.6
Reed	**82.6**	2.3	**137.3**
SHSR-02	61.2	2.3	105.1
SHSR-03	54.0	2.8	95.9
Toro Can.	61.2	**3.1**	120.3
Velvick^D	**72.7**	2.3	**135.7**
Zutano	57.1	2.4	115.3

Yield and Production Efficiency

Hass on Cloned Rootstocks at Goodwood (Childers), QLD

Rootstock	Yield 09 (kg/tree)	YE (kg/m^3)	Cumulative Yield 07-09
A8	47.9	1.8	80.2
A10	49.8	1.9	90.8
Duke 7	49.9	**3.2**	103.1
Nabal	49.0	1.5	88.2
SHSR-03	**64.0**	**2.6**	**121.1**
Thomas	37.5	2.1	72.7
Velvick^{CP}	39.2	**2.6**	102.0
V1	**70.1**	2.2	**139.4**
Zutano	36.0	2.3	82.7

Yield and Production Efficiency

Hass on Seedling Rootstocks at Duranbah, NSW

Rootstock	Yield 09 (kg/tree)	YE (kg/m^3)	Cumulative Yield 07-09
A8	14.8	**3.4**	**29.1**
A10	10.2	1.5	17.1
Barr Duke	10.6	**2.9**	21.2
Nabal	**18.7**	1.8	**31.4**
Parida	9.9	**3.2**	26.3
Peasley	15.9	1.8	24.9
Reed	6.8	1.7	21.1
SHSR-02	**18.0**	1.6	**36.3**
SHSR-03	15.5	1.9	25.5
Toro Can.	8.2	0.8	17.6
Velvick^D	**25.9**	**3.1**	**38.5**

Yield and Production Efficiency

Hass on Cloned Rootstocks at Duranbah, NSW

Rootstock	Yield 09 (kg/tree)	YE (kg/m^3)	Cumulative Yield 07-09
A10	11.9	**1.2**	**21.8**
Barr Duke	5.6	1.0	10.8
Duke 7	4.0	0.7	5.2
Hass	9.4	1.1	17.8
Toro Can.	**10.5**	**1.2**	18.3
Velvick^{CP}	**13.4**	0.7	**27.5**

Yield and Production Efficiency

Hass on Seedling Rootstocks at Hampton, QLD

Rootstock	Yield 08 (kg/tree)	YE (kg/m^3)	Cumulative Yield 07-08
A8	27.6	1.3	29.6
A10	40.4	**1.6**	49.8
Duke 7	33.7	1.4	34.9
Nabal	40.2	1.4	44.0
Plowman	40.2	1.1	41.8
Reed	32.9	0.9	35.9
SHSR-02	**51.7**	1.5	**57.5**
SHSR-03	32.3	**2.0**	39.9
Velvick^D	**57.8**	**1.8**	**63.4**
Vel./Int.	17.1	1.6	18.3
Zutano	**46.8**	**1.7**	**55.5**

Yield and Production Efficiency

Hass on Cloned Rootstocks at Hampton, QLD

Rootstock	Yield 08 (kg/tree)	YE (kg/m^3)	Cumulative Yield 07-09
A8	37.9	**1.5**	45.3
A10	29.5	1.0	38.4
Duke 7	**45.5**	1.5	**55.7**
Hass	26.5	0.8	31.4
Nabal	19.2	0.8	23.5
Plowman	**40.7**	**1.6**	48.2
SHSR-03	**54.1**	**1.7**	**63.4**
Reed	24.1	0.7	27.7
Velvick^{CP}	37.7	1.1	44.7
Zutano	35.6	1.2	45.9

Yield and Production Efficiency

Hass on Seedling Rootstocks at Pemberton, WA

Rootstock	Yield 08 (kg/tree)	YE (kg/m^3)
A10	31.8	**5.0**
Duke 7	22.9	3.8
Nabal	27.5	3.4
Plowman	25.2	3.2
Reed	19.6	2.5
SHSR-02	**33.8**	**4.4**
Toro Can.	31.7	**4.8**
V1	**32.0**	4.2
Velvick^D	**38.6**	3.5

Yield and Production Efficiency

Hass on Cloned Rootstocks at Pemberton, WA

Rootstock	Yield 08 (kg/tree)	YE (kg/m^3)
A10	27.9	**4.7**
Barr Duke	29.5	**4.8**
Duke 7	26.8	2.9
Hass	**41.4**	**7.8**
Nabal	17.0	4.2
Reed	25.0	3.6
SHSR-01	19.6	2.5
Velvick^{CP}	**30.7**	3.7
Zutano	**48.4**	3.8

Conclusions

	Seedling	Clones
Pc sites	SHSR-02 Velvick^{D} Nabal V1	Hass Velvick^{CP} Zutano Duke 7 SHSR-03
All sites	SHSR-02 Velvick^{D} Nabal V1 Zutano	Velvick^{CP} Duke 7 Hass SHSR-03 Zutano

Conclusions

- Site history influences rootstock performance
- Region (environment) influences rootstock performance
- There is no conclusive evidence that cloned rootstocks are yielding better than seedlings

Acknowledgements

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Updated Edition of CABI Avocado book to be published. 50 International authors. Target release 2011.