AVOCADO ROOTSTOCK RESEARCH AND PRODUCTION COMPARISONS.

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Maluma DAY 2016

Principles and practices for modern farming

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INTRODUCTION

- **No factor of the avocado industry is more important than rootstocks, and there is no problem that we know less about or which requires a longer time to solve (Webber 1926).**

- **De Villiers & Ernst (2007) reported on the importance of a proper and reliable clonal rooting technique in avocados that will guarantee a good clonal root system.**

- **It has also been confirmed that when buying clonal avocado trees, each plant must have a well-developed and distributed clonal rooting system with good quality and quantity of roots.**

- **The direct correlation between a good clonal rooting system and uniformity in any avocado orchard is a known fact.**

- **Brokaw (1987a) concluded that if variability among clonal trees exist it might be explained by differences induced in the nursery.**

- **According to De Villiers & Ernst (2007) a well-developed, evenly distributed and healthy clonal root system ensures maximum utilization of the tree's genetic potential.**

- **Clonal propagation of avocados is the only way to conserve and utilize certain tree characteristics like precocity and production (Hartman & Kester, 1975).**

Precocity

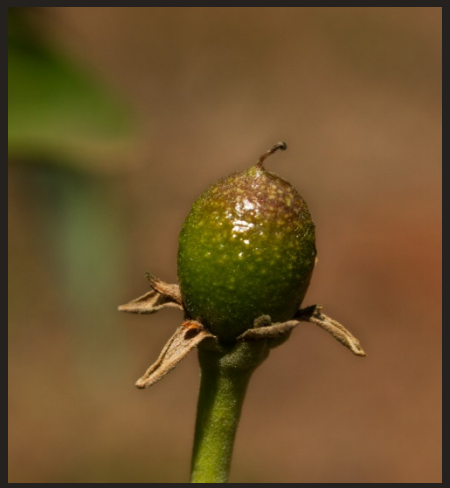
Production

- **Although seedling rootstocks are still widely used, clonal rootstocks are the rootstocks of the future (Wolstenholme 1988).**

- **Ben-Ya'acov et al (1992) concluded that developed avocado industries were shifting to clonal rootstocks and indicated that over a million of these trees had already been planted.**

OBJECTIVE OF THIS STUDY

- **The objective of this study is to compare the production potential of different clonal rootstocks grafted with Hass and Maluma.**
- **Suitability of the clonal rootstocks in different spacing and densities.**



MATERIALS AND METHODS

Experiment 1

The influence and field performance of Hass grafted to different clonal rootstocks were evaluated in two different trail blocks:

1. **Planted in 1993, Hass was grafted to four different clonal rootstocks namely Duke 7, Duke 9, Barr-Duke and Thomas. The production was recorded for five years (2004-2008) and evaluated.**

2. **Planted in March 2003, Hass was grafted to six different clonal rootstocks namely Dusa, Velvick, Duke 7, Bounty, Hass clone and Martin Grande. The production was recorded for four years (2006-2009) and evaluated.**

Experiment 2

Due to the Maluma cultivar's attributes and potential as a new generation scion cultivar, Allesbeste Nursery decided to conduct all future rootstock research with Maluma as scion.

- **A phase 1 high density planting (808 trees/ha) with Maluma grafted to Dusa, Bounty and Duke 7 clonal rootstocks was planted in October 2009.**

- **The production of each combination was recorded for five years (2012-2016) and evaluated.**

Experiment 3

A phase two ultra–high density planting of 2.5m x 2.5m (1600 trees/ha) with Maluma grafted to Dusa, Bounty and Duke 7 clonal rootstocks was planted In May 2012.

- **The growth vigour and production of each combination was recorded for three years (2014-2016) and evaluated.**
- **This trail block was planted on the farm Avondshoek in the Tzaneen area and is a replant site, previously planted with Ryan on Duke 7 seedling rootstock trees.**

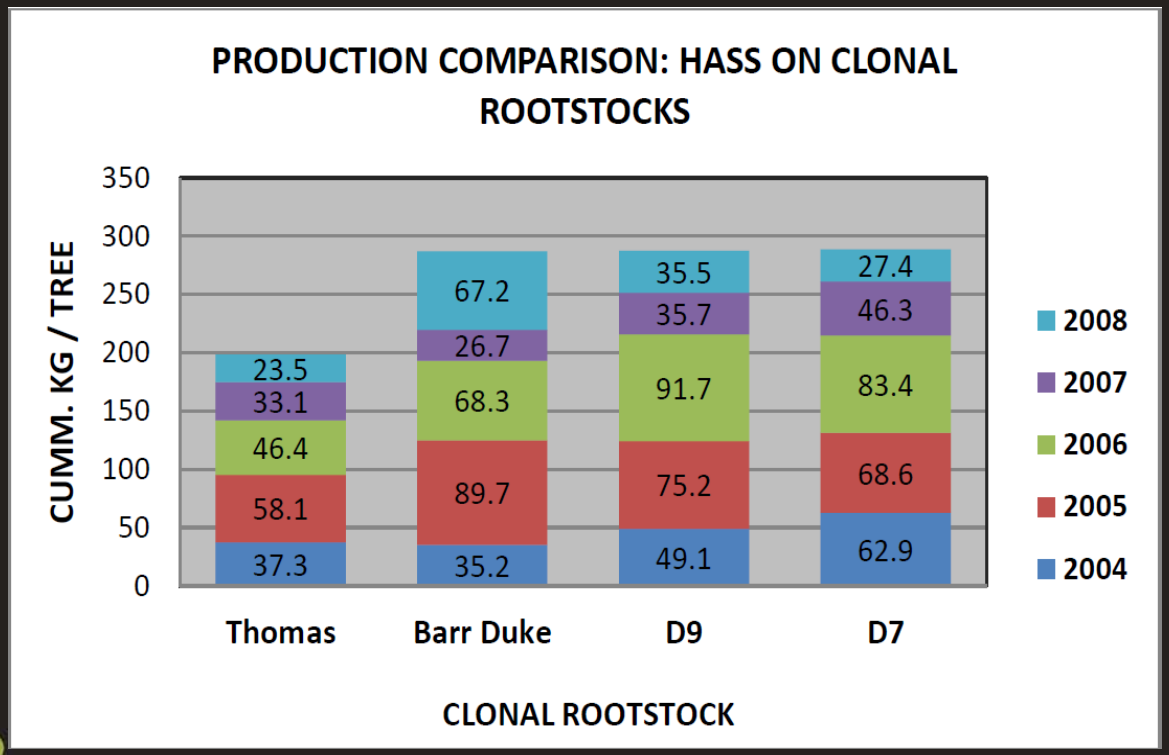
RESULTS

Experiment 1.

Planted in 1993

First trail where Hass was grafted to Duke 7, D9, Barr-Duke and Thomas.

Experiment 1.



Cumm. Production:

- D7 = 289 kg
- D9 = 287.2 kg
- Barr-Duke = 287 kg
- Thomas = 198 kg

Figure 1. Production of Hass grafted to four different clonal rootstocks.

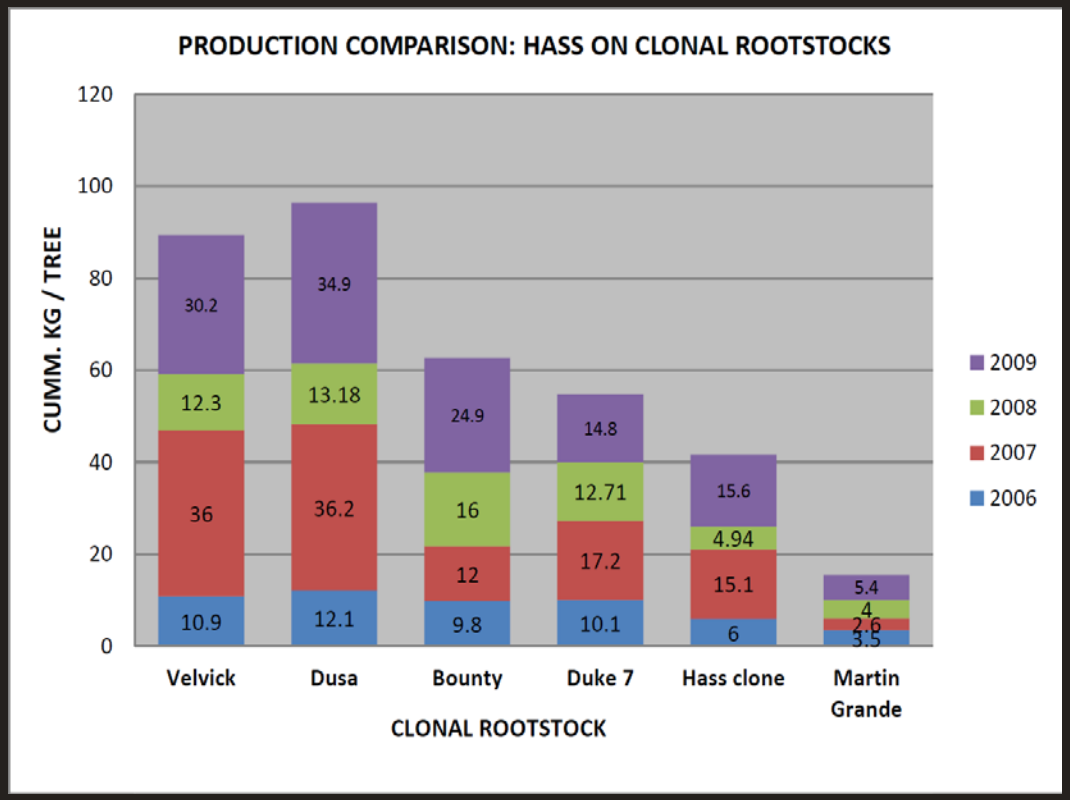
Over a five year period the best yields were obtained by Duke 7, D9 and Barr-Duke.

Experiment 1.

Planted March 2003

Second trail where Hass was grafted to Velvick, Dusa, Bounty, Duke 7, Hass clone and Martin Grande.

Experiment 1.



Cumm. Production:

- Dusa = 96.4 kg
- Velvick = 89.4 kg
- Bounty = 62.7 kg
- Duke 7 = 54.8 kg
- Hass clone= 41.6 kg
- Martin Grande = 15.5 kg

Figure 2. Production of Hass grafted to six different clonal rootstocks(408 trees/ha).

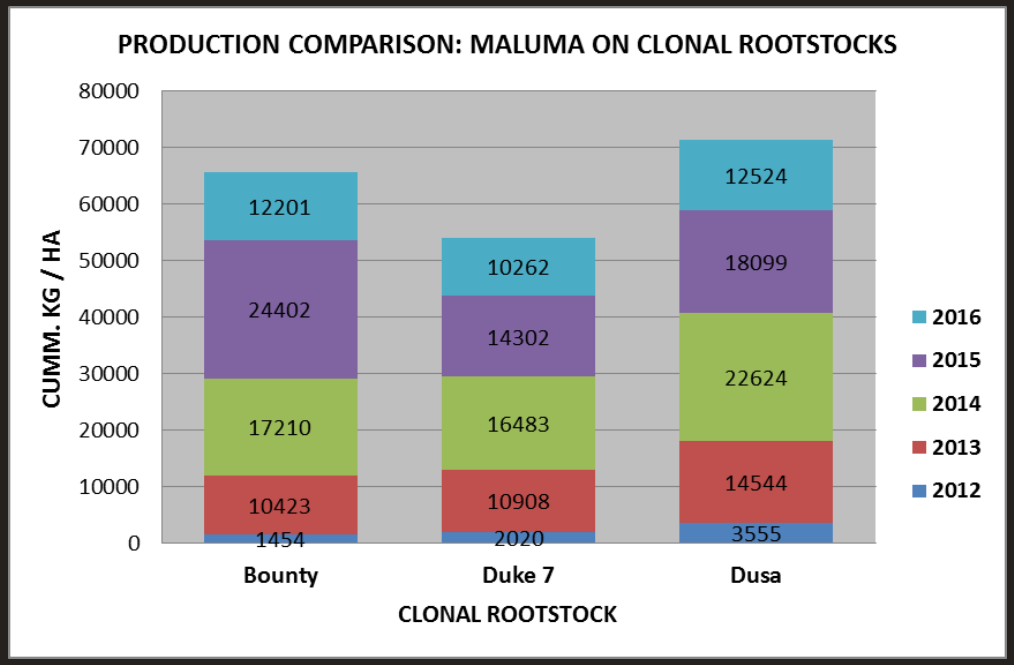
Hass grafted to Dusa and Velvick substantially outperformed Bounty and Duke 7.

Experiment 2.

Maluma grafted to Dusa, Bounty and Duke 7 and planted at 808 trees/ha.

October 2009

Experiment 2.



Cumm. Production (kg/ha)

- Dusa = 71346 kg
- Bounty = 65690 kg
- Duke 7 = 53975 kg

Avg production (kg/ha)

- Dusa = 14269 kg/ha
- Bounty = 13138 kg/ha
- Duke 7 = 10795 kg/ha

Figure 3. Production of Maluma grafted to three different clonal rootstocks(808 trees/ha).

Maluma grafted to clonal Dusa, Bounty and Duke 7 the highest cumulative yield was recorded with Dusa. Bounty's production improved every year and outperformed the other two rootstocks in 2015. The 2016 production figures are estimated date.

Experiment 3.

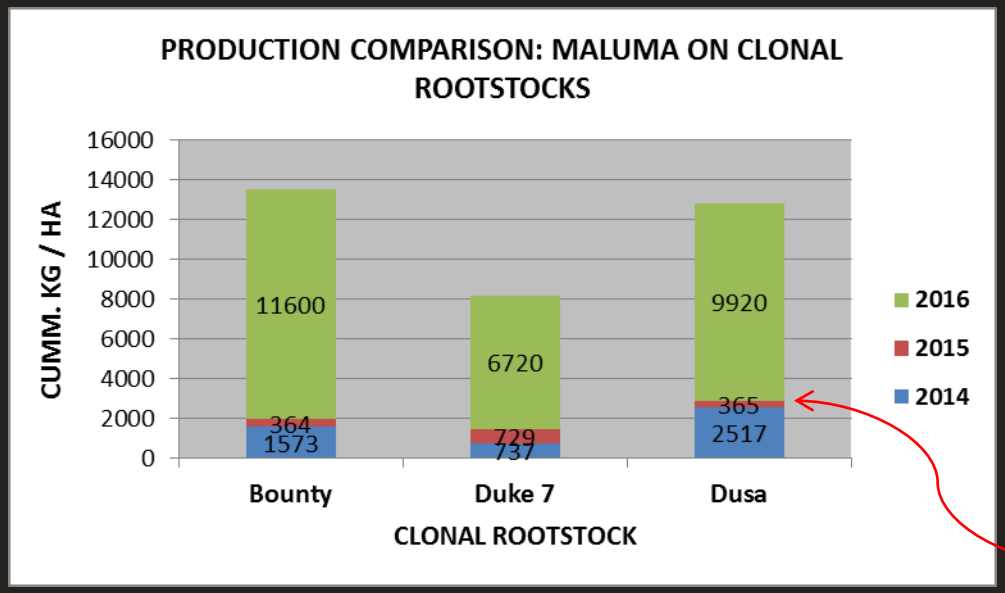
An ultra – high density planting of 2.5m x 2.5m (1600 trees/ha)with Maluma grafted to Dusa, Bounty and Duke 7. Trail block was planted in May 2012.

Dusa

Bounty

Duke 7

Experiment 3.



Cumm. Production (kg/ha)

- Dusa = 12802 kg
- Bounty = 13537 kg
- Duke 7 = 8186kg

Avg production (kg/ha)

- Dusa = 4267 kg/ha
- Bounty = 4512 kg/ha
- Duke 7 = 2728 kg/ha

Heavy hailstorm

Figure 4. Production of Maluma grafted to three different clonal rootstocks(1600 trees/ha).

Bounty outperformed Dusa and Duke 7 clonal rootstocks. The 2016 production figures are estimated data.

Experiment 3.

This block was a replant and field observations shown that Bounty established the best of the three rootstocks.

Table 1. Measurements (average) taken 18 months after plant date.

ROOTSTOCK	STEM DIAMETER (mm)	TREE HEIGHT (mm)	CANOPY DIAMETER (mm)
BOUNTY	45	1900	1216
DUSA	37	1600	1080
DUKE 7	35	1580	1020

DUKE 7

BOUNTY

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DISCUSSION AND CONCLUSION.

- **There is enough evidence that tree uniformity observed in the field directly relates to the rooting technique used in the nursery.**
- **Improving the clonal root system in the nursery will undoubtedly have a positive effect on the tree performance in the field.**

- **A superior clonal rooting system, as reported by De Villiers & Ernst (2007), not only resulted in uniformity in the orchard but ensures maximum utilization of the tree's genetic potential.**

- **It is evident that the avocado industry will in future rely more on clonal rootstocks, not only because of its higher production and resistance against Phytophtora root rot but more specifically due to its advantage in replant situations.**

- This study also confirms that the production potential of the scion will be optimised by the correct clonal rootstock-scion combination.

- De Villiers & Ernst (2007) reported that the difficulty to successfully root Velvick rootstock clonally resulted in the discontinuing of Velvick in further rootstock research.

- Thomas, another second generation rootstock has also been discontinued because of its poor performance and supports the observations of Coffey and Guillemet (1987a) that Hass grafted on Thomas is not a recommended clonal rootstock for South Africa.

- **Of the third generation rootstocks Dusa grafted with Hass and Maluma is still the best combination, especially on virgin soils.**

- **According to Retief (2011) Dusa accounted for 50% of the nursery sales of the South African Avocado Nurserymens' Association member-nurseries during 2009-2010 and continues to gain popularity.**

- **The results indicate that Bounty rootstock grafted to Maluma to be the best performing rootstock for marginal soils and especially in replant sites.**

- **Bounty (Retief, 2011) is the third most popular clonal rootstock after Dusa and Duke 7 in South Africa.**

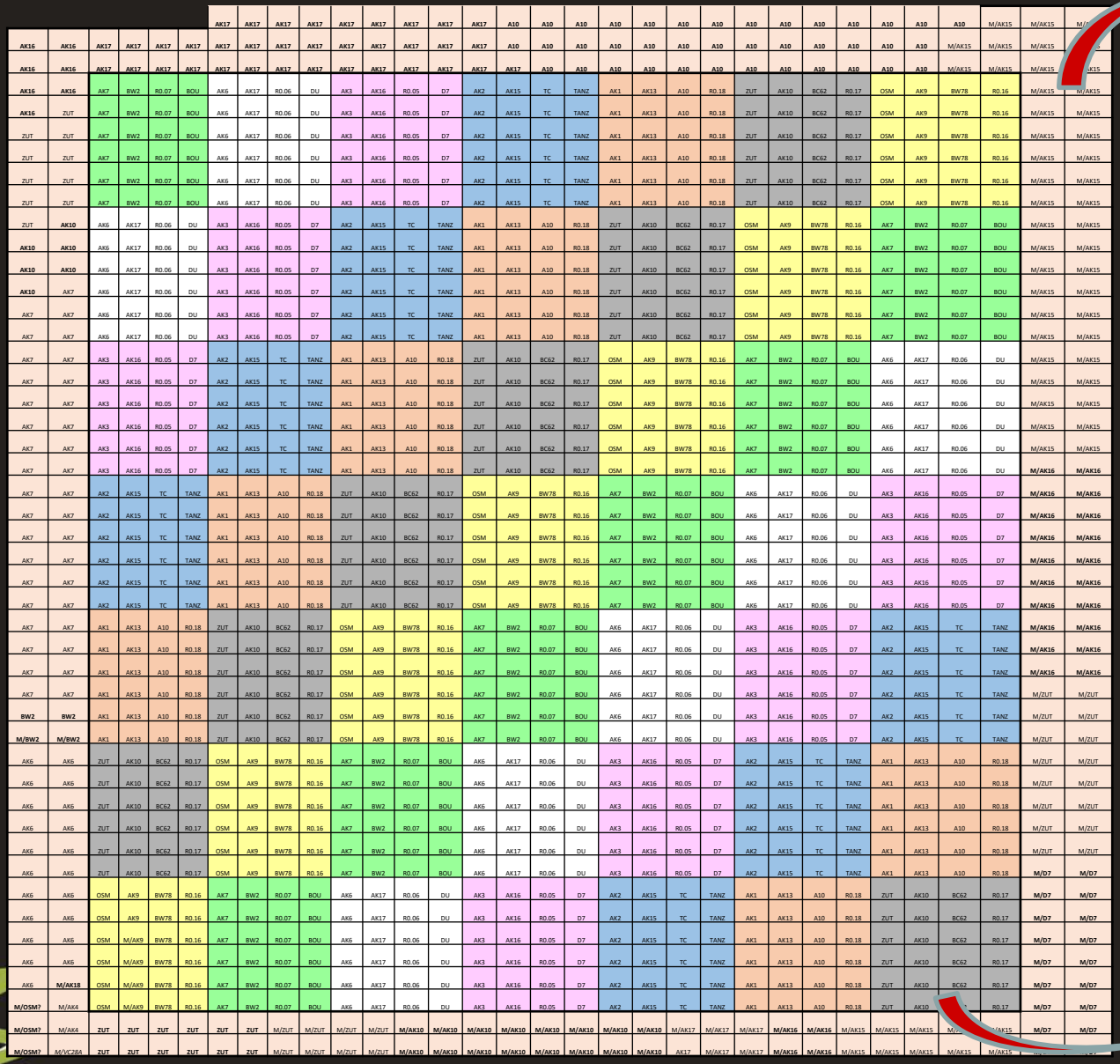
- **A new generation clonal rootstock not only has to be better than the current available clonal rootstocks but also have to support and enhance the genetically entrenched horticultural characteristics of the scion cultivar.**

- **Findings with this study also support the fact that the shortcomings of a scion cannot be addressed or rectified with a rootstock.**

- **The two imperfections of Hass namely fruit size and low production, with no substantial improvement through the use of different rootstocks, emphasizes the use of new generation scion cultivars such as Maluma in rootstock research.**

- **As Maluma possesses certain horticultural and marketing attributes superior to Hass and since Maluma is already accepted by the market as a commercial cultivar, it in practice justifies to in favor of Maluma, discontinue the using of Hass as the standard in future rootstock research.**

- **In the on-going search for a superior high productive clonal rootstock, a new trail where Maluma grafted to 28 clonal rootstocks was planted in December 2015.**
- **This trail was planted at a density of 1250 trees/ha (4m x 2m) and include Dusa, Bounty, Duke 7, Allesbeste nursery's own selections as well as some promising international rootstocks and selections.**



Guard trees

- Randomized block design
- 28 rootstocks
- 6 treatments per rootstock
- 7 repetitions per rootstock
- Total trail trees = 1176
- Spacing = 4m x 2 m
- 1250 trees/ha

ZUT	AK10	BC62	R0.17
ZUT	AK10	BC62	R0.17
ZUT	AK10	BC62	R0.17
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“In order to succeed, your desire for success should be greater than your fear of failure.” – Bill Cosby


MICRO - CLONE


MALUMA


MALUMA

THANK YOU

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