



*TREE UNIFORMITY: DETERMINING FACTORS – A
FIELD OBSERVATION.*



BY

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INTRODUCTION

Tree uniformity is not only important as far as appearance is concerned, but ultimately the most important factor is the yield or production per hectare which will secure a high and sustainable return on investment.

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The known factors influencing tree uniformity are:

1. Sunblotch Viroid



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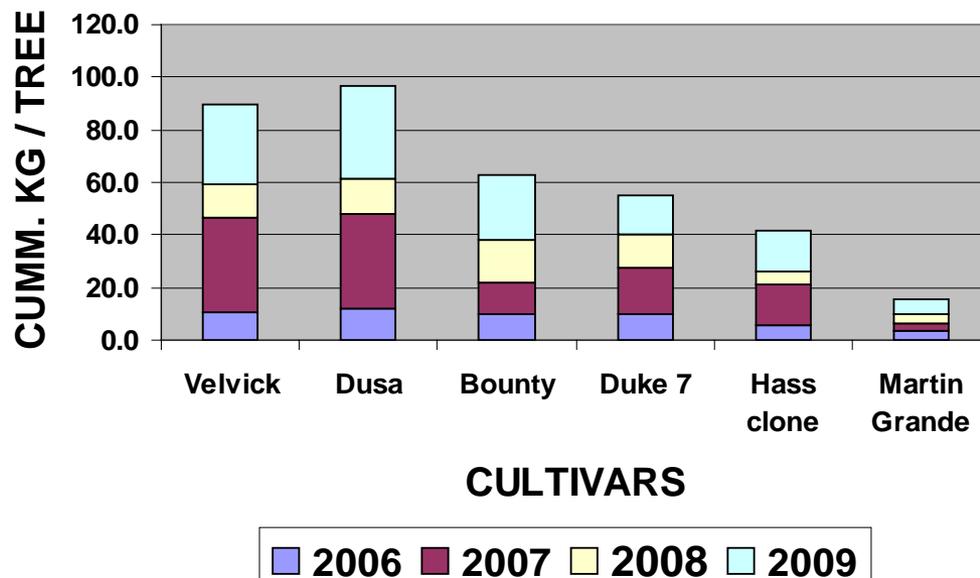
2. Rootstock – scion combinations.

- Graft incompatibility.



3. Genetic influence of the rootstock on the production potential of the scion.

PRODUCTION COMPARISON: HASS ON CLONAL ROOTSTOCKS



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4. Genetic variability of seedling rootstocks.

Even more so with Mexican type (Duke 7) than with West Indian (Velvick) type seeds.



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Genetic variability: seedling vs clonal rootstock.



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5. Clonal rootstock (genetically identical combination)



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- It is a known fact that the only way to conserve and utilize the outstanding characteristics of an avocado rootstock is through clonal propagation.
- Ben – Ya’acov(1995) confirmed that only the identity of the clonal rootstock and cultivar source is preserved with clonal propagation where the nurse seed is eliminated.
- No genetic material moves through the plant system from the nurse seed to the clonal rootstock.

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De Villiers & Ernst (2007) suggested that plants produced with the Frolich technique (which are still partially supported by a seedling root system) increases the possibility of a poorly developed clonal root system and can lead to poor tree uniformity.



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Clonal rootstocks are known to produce uniformity but even more so to preserve special characteristics of which precocity and production is the most important (Hartman & Kester,1975).



Precocity



Production

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To ensure maximum utilization of the tree's genetic potential, as well as uniformity in the field, a well developed, evenly distributed and healthy clonal root system is imperative (De Villiers & Ernst,2007).



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6. Adaptability of rootstocks to specific soil and climatic conditions.

Bounty rootstock is known to be more tolerant of soils where a waterlogged situation might occur.

Ryan favors higher altitudes with cooler temperatures:

In the Tzaneen area of Limpopo Province (South Africa) yields differ from 38 T/ha at 1350 meter above sea level to 5 T/ha at 800m above sea level.

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Anon (2005) reported non – uniformity among clonal Velvick trees in the Soekmekaar area of the Limpopo Province.

These trees were planted in an evaluation trail with Hass on clonal Dusa and Velvick rootstocks.

The Velvick trees were micro clonally propagated trees.



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OBJECTIVE OF THIS STUDY

The objective of this study is to investigate and determine the REASONS WHY non-uniformity does occur in certain clonal rootstock avocado orchards.

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MATERIALS AND METHODS

Observations at various stages of the two commercially used clonal propagation techniques were made.

Emphasis on:

- 1. root quality**
- 2. root quantity**
- 3. root distribution**

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Observations - Micro – cloning :

- a) Rooted micro clonal plant in 55 mℓ container.
- b) Grafted micro clonal plant when transplanting in the 7L container (plastic bag).
- c) Before transplanting into the field.
- d) Field observations.

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Observations - Frolich :

- a) Rooted clonal plant in 1L liner bag.
- b) Grafted clonal plant when transplanting in the 7L container (plastic bag).
- c) Before transplanting into the field.
- d) Field observations.

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Field observations with reference to tree uniformity were made in the Kwazulu – Natal as well as the Mooketsi, Soekmekaar and Tzaneen area of the Limpopo Province of South Africa.

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Results and discussions.

- 1. Micro cloning propagation technique:**
 - Inspection of the rooted micro clonal plant for root quality and quantity in the 55 ml container is possible.**



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- By severing the micro clone from the nurse seedling (Ernst,1999) the clonal root system can effectively be inspected in the micro-liner area, as well as before transplanting in the 7L containers(plant bags).



Plants with a poorly developed clonal root system can be discarded if not on standard

Micro-liner area



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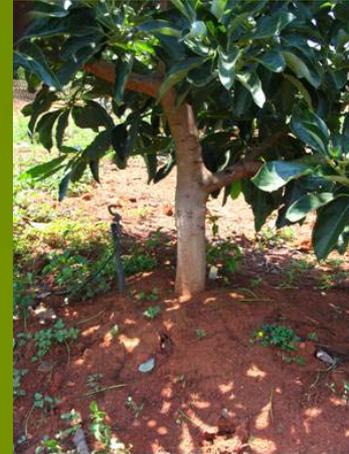


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- Inspection of the micro-clonally propagated plant before planting in the orchard.



- **Field observation : Uniformity in a commercial avocado orchard.**



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2. Frolich propagation technique:

- Inspection of the clonal root system for quality and quantity in the 1L liner bag is not possible without destruction



CLOAL ROOTS



NURSE SEEDLING
ROOTS



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With both root systems still intact in the 1L liner bag, identifying plants with poorly developed clonal roots is impractical if not impossible.



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- With the Frolich technique poor clonal root quality, quantity and uneven distribution is concealed by the presence of the nurse seedling's root system and not easily detectable when transplanting in the 7L container (planting bag).



Clonal root system

Nurse seed root system



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- **Field observation.**

The possibility of transplanting grafted plants with no or poorly developed clonal roots in the field resulted in non-uniformity in the orchard.



- Older trees with poor root quality and uneven distribution tilting over with a heavier flower on the down side of the tree.



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Non-uniform clonal Velvick in Hass evaluation trail.

Velvick trees



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Non-uniform clonal Velvick in Hass evaluation trail.

A thorough investigation into the reasons for the non-uniformity among micro clonally propagated Velvick trees revealed the following :

All the small and stunted plants had heavy callus formation with poorly developed clonal roots.

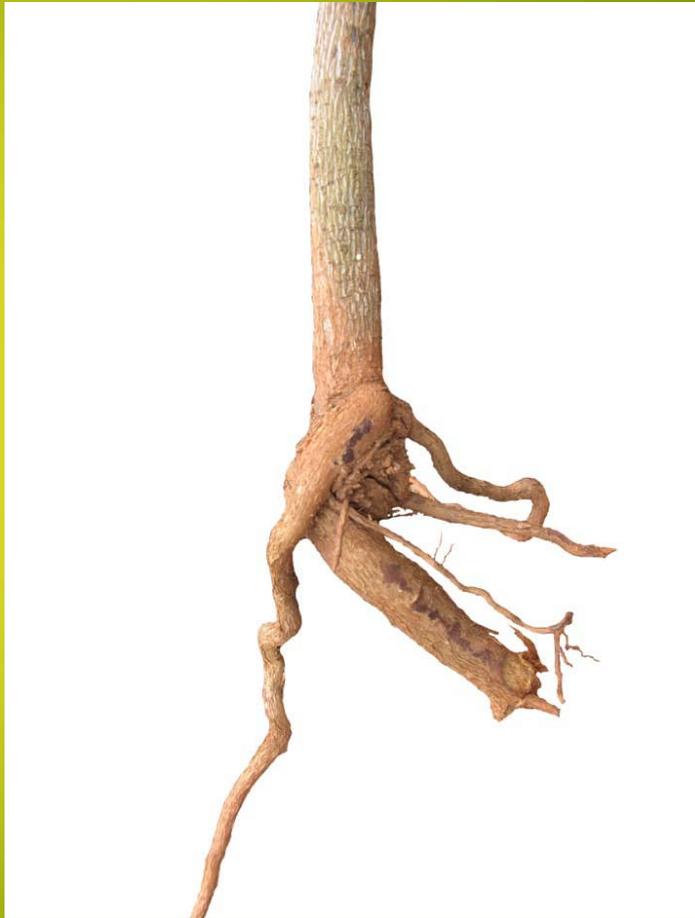
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Callus formation and poor root systems.



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Further investigation revealed that the poor root quality and heavy callus formation relates back to the rooting stage in the nursery.



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It was obvious that these plants should have been culled in the nursery and that the reason for the non-uniformity could not be blamed on the Velvick rootstock.

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CONCLUSION

There is enough evidence to conclude that tree uniformity directly relates to the rooting technique used in the nursery.

The rooting technique should provide for the execution of proper quality surveys to inspect clonal root development and quality.

The efficient management of this technique is imperative for success.

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The most crucial stage of inspection is before transplanting into the 7L bag to ensure culling of plants with no or poorly developed clonal roots.

It is also conclusive that poor uniformity with clonal rootstocks is the result of:

- a) uneven root distribution**
- b) poor root quality and quantity**
- c) heavy callus formation**

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Ernst(1984) found that heavy callus formation during rooting resulted in uneven root distribution with poor quality and quantity.

This contradicted the suggestions by Anon(2005)that non-uniformity among Hass on Velvick is genetically.

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Through evaluation and observation in commercial plantings it is evident that the only guarantee for a uniform clonal orchard is if each tree relies **TOTALLY** on a well developed clonal root system.

De Villiers & Ernst(2007) found a direct correlation between poor tree uniformity (high mortalities) and a poorly developed clonal root system, which is possible where the plants are partially supported by a seedling root system of a nurse seed.

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This study confirms the importance for producers to buy clonal avocado trees from a nursery who uses a propagation technique where the clonal root system can efficiently be inspected at various stages. This ensures superior trees that will earn high returns on investment.



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THANK YOU



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**“The PESSIMIST sees difficulty in every opportunity,
The OPTIMIST sees opportunity in every difficulty.”**

- WINSTON CHURCHILL



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