

## **PRACTICAL VALUE OF THE ALLESBESTE MICRO CLONING TECHNIQUE**

A. de Villiers and A. Ernst

Allesbeste Nursery, P.O. Box 91, Tzaneen, 0850, Republic of South Africa. E-mail: ernst@allesbeste.co.za. Website: <http://www.allesbeste.com>

The Micro Cloning technique as published in the proceedings of the World Avocado Congress IV was developed by Allesbeste Nursery, a leading clonal avocado nursery in South Africa, situated in the Letaba region of the Limpopo Province. This technique is derived from the so-called Frolich technique, which is used as a standard by various nurseries worldwide. The Micro Cloning technique is proven to be superior to the Frolich technique:

- More than one clonal plant produced per nurse seed.
- Repeated use of nurse seed until depletion of seed resources.
- Reduction in propagation costs due to technique efficiency.
- Buffer zone between clonal and seedling root systems with phytosanitary advantage.
- Inspection of root system for quality and quantity with decreased transplant losses.
- Plants kept in micro liner area are less space consuming.
- Regulated flow of plants through fertiliser management in micro containers.
- Production of Micro Clonal plants in compliance with highest phytosanitary standards
- Cost efficient delivery of Micro Clones to distant growers or nurseries worldwide.
- Direct field planting of Micro Clones a viable option with significant cost savings.
- More even root distribution with outstanding quality.
- Nurse seedling survival in field nonexistent.
- Clonal root system and leaf canopy area in full balance at time of field planting.
- No establishment shock due to Micro Clonal tree's reliance on clonal root system only.
- Tree uniformity significantly better.
- Excellent root system ensures maximum utilisation of tree's genetic potential.

Key words: Propagation technique, superior, phytosanitary standards, cost efficient, nurse seedling, establishment, uniformity.

## VALOR PRÁCTICO DE LA TÉCNICA DE MICRO CLONACIÓN DE ALLESBESTE

A. de Villiers y A. Ernst

Allesbeste Nursery, P.O. Box 91, Tzaneen, 0850, Republic of South Africa. E-mail: [ernst@allesbeste.co.za](mailto:ernst@allesbeste.co.za). Website: <http://www.allesbeste.com>

La técnica de microclonación, tal cual fue publicada en el procedimiento del IV Congreso Mundial del Aguacate / palta, fue desarrollada por el Vivero Allesbeste, líder en producción de Aguacates / paltos clonados en Sudáfrica, ubicado en la región de Letaba, provincia de Limpopo. Esta técnica proviene de la técnica conocida como “Frolich”, utilizado como estándar por varios viveros en el mundo. Está comprobado que la técnica de microclonación es superior a la de Frolich:

- Más de una planta clonada es producida por semilla nodriza.
- Utilización repetida de la semilla nodriza hasta que los recursos de la semilla sean agotados.
- Reducción de costo de la propagación por eficiencia de la técnica.
- Zona de protección entre sistemas de raíces clonadas y de plántulas con ventaja fitosanitaria.
- Inspección de sistema radicular por calidad y cantidad con menos pérdidas durante el trasplante.
- Plantas mantenidas en área con micro bolsas consumen menos espacio.
- Circulación regulada de plantas por medio de control de fertilizante en microcontenedores.
- Producción de micro plantas clonadas de acuerdo con los más altos estándares fitosanitarios.
- Eficacia en relación al costo de la distribución de micro clones a productores distantes o viveros a nivel mundial.
- Plantación directa en campo de micro clones es una opción viable con ahorros significativos.
- Distribución más equitativa de raíces con excelente calidad.
- Sobrevivencia de plántulas nodrizas en el campo no existente.
- Equilibrio entre sistema de raíces y follaje perfecto al tiempo de plantarse en el campo.
- Ningún impacto al establecerse debido a que el árbol micro clonado depende únicamente de su sistema radicular.
- Uniformidad entre árboles significativamente mejor.
- Excelente sistema de raíces asegura la utilización máxima del potencial genético del árbol.

Palabras clave: Técnica de la propagación, superior, estándares fitosanitarios, eficacia de costo, almacigos, establecerse, uniformidad.

## 1. Introduction

It is commonly known that clonal propagation techniques of avocados are labour intensive, costly and requires a lot of effort and attention to detail. Various nurseries worldwide use the so-called Frolich technique (Frolich *et al*, 1971-72) to propagate avocado trees. Brokaw (1975) reported on a patented variation of the Frolich method that streamlines the commercial propagation of clonal avocado trees. According to Brokaw, a planting sleeve (liner bag) configuration, a single etiolated shoot and the addition of a loosely clamped metal ring placed just above the bud union to constrict and to eventually sever the nurse seedling forms the basis of this technique (Brokaw, 1975). However it is believed that this method still has certain shortcomings and disadvantages.

Allesbeste Nursery developed a micro cloning technique during 1990, which proved to be a huge improvement on the Frolich technique as modified by Brokaw. This technique, which was derived from the Frolich technique, implies the positioning of 55 millilitre micro containers over the multiple etiolated shoots (one per shoot), which developed simultaneously and consecutively from the so-called nurse graft. Root initiation occurs within these containers. After successful grafting of these shoots to a commercial scion cultivar, these fully developed avocado plants (clones) are separated from the nurse seedling just above the nurse graft. Usually after hardening off, the wholesale nursery will transplant these micro clones to 7 litre containers or plant bags (Ernst, 1999). This micro cloning technique was revolutionary in the sense that for the first time it was possible to fully inspect the developed clonal root system, without disturbing it, for quality and quantity with decreased transplant losses.

Since the development of the Allesbeste Micro Cloning technique in 1990 approximately 650 000 micro clones were sold to clients in various locations and countries.

The objective of this study was to prove the practical value of the Allesbeste Micro Cloning technique in comparison with the Frolich technique.

## 2. Materials And Methods

Observations at various stages of the micro clone propagation process were conducted in Allesbeste Nursery. These stages include nurse seedling, etiolation, rooting and transplanting (7L bag).

All trees observed in the field formed part of commercially planted orchards. Micro cloned trees were supplied by Allesbeste Nursery whereas the Frolich technique propagated trees came from another reputable South African nursery, both of whom are rated 5 stars in accordance to the South African Avocado Nurserymen

Association's accreditation system. Field observations were made in the Mooketsi, Soekmeaar and Tzaneen area of the Limpopo Province of South Africa. Observations were made with regard to field establishment, clonal root distribution and quality, nurse seedling survival, clonal root-leaf ratio and tree uniformity.

### 3. Results and Discussion

TABLE 1. Comparative observations between the Micro Cloning and Frolich techniques.

<b>Observation</b>	<b>Micro Cloning</b>	<b>Frolich</b>
No.of plants / nurse seed / round	2 -3	1
Reuse of grafted nurse seed	Yes	No
Buffer zone between clonal and seedling roots	Yes	No
Visual inspection of clonal root system for quality / quantity	Yes	No
Space consumption	Less	More
Exportability	Low transport cost (Volume: 55 ml)	High transport cost (Volume: 1L)
Direct field planting	Yes	Probably
Nurse seedling survival in field	Impossible	Possible
Leaf : clonal root system ratio	1:1	1: 0.40 – 0.70
Root system reliance upon field transplanting	Clonal only	Clonal and seedling

According to Table 1 it is possible to produce more than one etiolated plant per grafted nurse seed as well as to re-use the nurse seed for a second round of grafting, thus making the micro cloning technique more cost efficient.

The so-called buffer zone created between the clonal and seedling root system (Table 1), by positioning a 55 ml polyethylene micro container over the etiolated shoot, has a further advantage, as reported by Ernst (1999), over the Frolich technique (Frolich *et al*, 1971-72) as modified by Brokaw (1975). The buffer zone makes the production of micro clonal plants possible in compliance with the highest

phytosanitary standards. Because of this, as well as the fact that the plants are light in weight (low volume), they can be exported cost efficiently and successfully worldwide (Table 1).

Being separated from the nurse seedling roots as a result of the use of micro containers, the inspection of the clonal root system at any time after separation for quality and quantity is a major advantage (Table 1).

Due to the efficiency of this micro cloning technique a substantial reduction in propagation cost is possible. Plants produced with the micro cloning technique are less space consuming in the nursery and by managing the fertilizer levels in the micro containers, the flow of plants (process and delivery dates) can be regulated more efficiently. The direct planting of micro clones in the field is an option with significant cost savings (Table 1)

During field observations it was found that some young trees propagated with the Frolich technique started dying off. Closer investigation revealed that mortality was due to the lack of, or poorly developed, clonal roots upon the abscission of the nurse seed. A further disadvantage of the above mentioned technique is that if the nurse seedling fails to separate profuse suckering may occur.

By severing the micro clone from the nurse seedling as reported by Ernst (1999), nurse seedling survival in the field is nonexistent. As trees produced by the Allesbeste Micro Clonal technique has no nurse seedling root system attached, only clonal roots are inspected for quality and quantity during field transplanting (Table 1). This does not only enable the supply of the best quality avocado trees to the client but also guarantees trees to be sold solely on a clonal root system. Because the clonal root system and leaf canopy are in full balance at the time of field planting, no establishment shock was evident. The micro clonal tree relies on the clonal root system only (Table 1).

A well-developed, evenly distributed and healthy clonal root system ensures maximum utilization of the tree's genetic potential and also significantly supports uniformity of the trees in the field.

#### 4. Conclusion

It is concluded that the Micro Cloning technique is more modern and superior to the Frolich technique. With this method it is possible to deliver a tree with a guaranteed clonal root system of the highest quality to a client with less possible failure in the field.

Due to the fact that plants produced with the Frolich technique are still partially supported by a seedling root system, the possibility of a poorly developed clonal root system can lead to poor tree uniformity and even high mortalities.

Through continued evaluation and observation in commercial plantings it is evident that, compared to any other, the Allesbeste Micro Cloning technique has definite advantages.

The Micro Cloning technique is unique in the sense that it is possible to produce clonal plants, suitable for exports, small in size, light in weight and in compliance with the highest international phytosanitary standards. Consequently massive transport savings over long distances are possible and the export of nursery trees becomes a reality.

## 5. References

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