

AVOCADO NURSERYMEN'S ASSOCIATION

MANUAL



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IN COLLABORATION WITH THE ANA MEMBERS OF 1995
REVISED BY THE ANA MEMBERS OF 2016



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AVOCADO PLANT IMPROVEMENT SCHEME (APIS)

WHAT IS THE APIS

The Avocado Plant Improvement Scheme, which is managed jointly by the South African avocado growers' association (SAAGA) and ANA was initiated in 1983 with the founding of the Avocado Nurserymen's Association. The aim of the APIS is to improve the productivity of the avocado industry by ensuring that avocado nursery trees of the best possible quality are available to avocado growers. In essence the process entails the selection, production and distribution of disease free plant material of top quality and the certification of nursery trees produced by nurseries that participate in ANA.

WHICH CULTIVARS ARE INCLUDED IN THE APIS

All commercial scion- and rootstock cultivars, which are PPECB approved, are included in the APIS.



Commercial avocado varieties in South Africa:

Fuerte, Hass, Ryan, Edranol, Lamb Hass, Pinkerton, Gem, Carmen, Maluma, Harvest, Reed, Rinton, Gwen.

Clonal rootstocks:

Bounty, Duke 7, Dusa.

Seedling rootstocks:

Edranol, Etinger, Hass, Nabal, Velvick, Zutano, Duke.

WHAT HAPPENS TO A CULTIVAR WHEN IT IS INCLUDED IN THE APIS?

Cultivar evaluation blocks are blocks that are under the control of each nursery or otherwise managed by SAAGA. Material from cultivar evaluation blocks may be made available to accredited ANA nurseries for multiplication. It is the nursery owner's prerogative to multiply the material for supply to commercial avocado growers (customers). The process takes approximately two years from the time that the cultivar is released until it is made available to the grower.

WHAT ARE CULTIVAR EVALUATION BLOCKS?

The cultivar evaluation blocks are blocks that are planted to plant material selected from the cultivar selection programs and then tested on a semi-commercial basis. The cultivars have had to perform equal to or outperform one of the current commercial cultivars. The sites are established in each production area where avocados are generally grown.

CERTIFICATION OF NURSERY TREES

Certification of trees is based on the results of the area coordinator's visit and compliance to the nursery minimum standards set out under the ANA Nursery Improvement Scheme.

To administer the APIS, nurseries must keep a register of all certified trees sold to growers. The ANA secretary keep a database of all certified parent material provided to nurseries and of all certified trees sold to growers. In the event of problems arising, the material used in producing certified trees could then be traced to its origin. Nursery tree certification, based on the tree register, is issued to the grower for each batch of certified trees purchased. The aim of this two-fold certification system is to enable growers to see what the certification status of a nursery is, and serves as a long-term record of certified trees planted.

The nursery approvals, nursery monitoring, tree certification- and administrative procedures are meant to give the growers who order certified trees as much protection as possible.



The physical minimum requirements for the certification of nursery trees are as follows (14 points):

1. Trees must be planted in at least a 6-litre bag to ensure good root development.
2. Root distribution should be uniform from top to bottom in the bag.
3. The root system should be well branched with white root tips.
4. The well-developed root system must be free of harmful pathogens - based on laboratory sample results.
5. Every tree must be healthy and free of mechanical-, chemical- and insect damage in every respect.
6. Trees must have straight stems, with a smooth graft union.
7. The graft union should be between 50mm and 400mm above the growth medium surface (up to 450mm for seedling trees).
8. Stem diameter, at the growth medium surface, should be at least 8mm (seedling trees are usually much thicker).
9. Branching should not commence 300mm or less from the soil surface.
10. The tree should have at least 2 hardened off growth flushes.
11. There should be at least 10 fully grown leaves on the tree.
12. The leaves should be glossy dark green, without deformity, discolorations or signs of malnutrition.
13. There must be a record kept to show that the seed source material has been tested for avocado sunblotch viroid (ASBVd) within the last 2 years.
14. There must be a record kept to show that the scion material has been tested for avocado sunblotch viroid (ASBVd) within the last 3 years.

GROWER RESPONSIBILITIES

When trees are ordered the grower may (on appointment) visit the prospective nursery and examine trees to see whether the trees in the nursery comply with the requirements listed in points 1 to 14 above. Special attention must be paid to the general appearance of the nursery and the quality of the trees. The grower may open a few bags per batch to inspect the roots.

WHAT ARE THE GROWER'S RIGHTS AFTER HE HAS RECEIVED THE TREES?

If not stipulated differently in the contract of purchase, trees that do not comply with the minimum standards when the trees leave the nursery must not be planted. Growers are advised to do all inspections upon collection of the trees at the nursery.

CERTIFICATION OF A NURSERY

The APIS was introduced to ensure that disease free nursery trees of the best horticultural quality are available to the industry. To certify a nursery and hence become an accredited avocado nursery, nurseries have to prove that they strive to and is successful at large to:



1. Provide nursery trees that are cultivated free of *Phytophthora cinnamomi* (*P. c.*) using good sanitation and horticultural practices without routine use of chemicals used commercially such as Ridomil and phosphite fungicides for the control of *P. c.*
2. Index mother material for the presence of ASBVd.
3. Comply (minimum 61%, corresponding to a 3-star rating) with the minimum standards as set out in the ANA nursery improvement scheme.

NURSERY MONITORING

It is the responsibility of the area coordinator to take a 1L raw growing medium sample and irrigation water sample and send that off for *P. c.* analyses biannually. Samples can be sent to the Agricultural Quality Management, Research and Diagnostics Services (QMS) in Tzaneen or ARC in Nelspruit for *P. c.* testing. The laboratory must use a standardized, approved method for *P. c.* testing. Annual sampling weeks are preferably the first week in February and first week in August. The general standard of the nursery and plant material is monitored by the area coordinator of SAAGA through an annual inspection audit. Feedback from the area coordinator must be constructive and nurseries should be motivated to improve their standards.

PATHOGENS IN THE NURSERY

A maximum of 10% pathogen is acceptable for a batch of trees. A batch includes a maximum of 5000 plants - in big bags (≥ 6 litres) with the same rootstock and \pm the same planting date.

If more than 10% *P. c.* is detected in a batch of trees the following procedure should be followed:

1. The specific batch/es should be cordoned off;
2. None of these trees might be sold;
3. Remove and destroy all sick and weak looking plants;
4. Treatment for example Oxyacid™ (hydrogen peroxide) can be used on the remaining trees.

The specific batch(es) of trees must be retested within 6 weeks for the presence of pathogen.

If $< 10\%$ pathogen is detected after retesting trees from this batch may be sold again. If $> 10\%$ pathogen is detected after retesting, trees from this batch should be destroyed and nursery grading will again be adjusted accordingly.

VIROIDS IN THE NURSERY

Leaf sampling for ASBVd testing include 20 leaves from 20 trees (one leaf per tree) from a representative batch of $\leq 10\ 000$ trees. Each sample tree has to be clearly marked. When a positive result is obtained, the test trees must be destroyed and another representative sample must be taken. The batch (or 10 000 trees) must be



placed under quarantine and the receiving grower name must be communicated to the area coordinator in full confidence so as to confirm (within 6 months) that the batch is ASBVd free.

INDEXING OF MOTHER TREES

All plant material, i.e. mother material, used in the production of trees is selected for health, vigour and yield and indexed for the presence of ASBVd. The tests are done by the ITSC in Nelspruit as specified above.

ANA NURSERY IMPROVEMENT SCHEME (NIS)

WHAT IS THE ANA NIS?

This is an improvement scheme whereby nurseries have to comply with the physical minimum requirements for the certification of nursery trees and nursery minimum standards for SAAGA and ANA Certification follow when the nursery's standard correspond to at least a 3 star rating (> 65 %). This is necessary to ensure that a nursery complies with the phytosanitary requirements and produce *P. c.* and ASBVd free trees. The nursery must be registered with the Department of Agriculture, Forestry and Fisheries (DAFF) and be a member of ANA and SAAGA to obtain a certification audit. Nurserymen must be willing to have nurseries inspected at least twice a year by an area representative of SAAGA.

NURSERY MINIMUM STANDARDS (116 points)

Site selection and design (32 points)

1. The site must be isolated and well drained (preferably raised). (2 points)
2. Not closer than 10m from *P. c.* host plants. (1 point)
3. Waste water must not flow through the nursery. Provision has to be made for sufficient furrows and / or drainage channels at the top end and sides of the nursery area. (4 points)
4. The nursery area has to be sanitised and kept as clean as possible. (1 point)
5. Facilities where every person entering the nursery can wash their hands must be placed at convenient sites and provided with a cleaning agent. (4 points)
6. The nursery area must be suitably fenced to keep out vehicles, people and animals. (3 points)
7. Entry to the site must be restricted, with preferably one entrance only. (1 point)



8. Each entry point must have a footbath that is protected from rain, containing an effective fungicide such as copper sulphate or copper oxychloride. Footbaths must also be established between the different sections where the possibility of recontamination exists in the nursery, e.g. between the fumigation and planting areas. (4 points)
9. Implements must be restricted to a certain part of the nursery, e.g. the fumigation or planting area, and be sterilized before use. (4 points)
10. The nursery floor and especially the footpaths must be well drained, preferably cemented or covered with crushed stone. (2 points)
11. Permanent, sturdy raised platforms - minimum of 200mm high - are necessary for placing the plant bags on. The design has to prevent water running out of the plant bags coming into contact with other bags. Cross contamination must be prevented during irrigation and rainfall. (3 points)
12. The platforms have to be sterilized before a new batch of trees is placed in them. (1 point)
13. Roads in the immediate vicinity (within 10 m) of the nursery must be kept dust free. (2 points)

Planting medium (10 points):

1. The medium must be well drained with Air Filled Porosity (AFP) of $\geq 20\%$. (2 points)
2. The planting medium should be sterilized, pasteurized, composted or certified clean by the supplier before being brought into the nursery to ensure that the medium will be free of *P. c.* (Phosphate and pH corrections should be done before sterilization) **OR**

Planting medium that has not been through above mentioned processes should at least be tested per batch for the presence of *P. c.* before being brought into the Nursery. (5 points)

3. Equipment and implements at risk of contamination when used in handling planting medium should also be decontaminated. (2 points)
4. If the medium is stored, it has to be kept covered until such a time that plant bags are filled. (1 point)

Water source (10 points):

1. Irrigation water must be tested at least twice a year by the area representative of SAAGA for the presence of *P. c.* and Pythium and the water should have a pH of 5.0 – 7.5; and EC of less than 75mS/m. (4 points)
2. Borehole water should preferably be used. The borehole must be deeper than 30m and preferably be in an area where *P. c.* host plants do not occur **OR**

Dam, canal and river water must be tested for *P. c.* and if positive purified and treated to ensure that it is free of pathogens. Filtration and/or water treatments can be used to achieve this. (4 points)



3. If irrigation is done by hand, the spray nozzles of the hosepipes must not come in contact with the soil surface. Provide suitable hooks on which to hook nozzles when they are not in use. (2 points)

Seed and bud wood (13 points):

1. All mother trees that provide seed (at least once every 2 years) and bud wood (at least once every 3 years) which is used in the propagation of ANA nursery trees *must be indexed for the presence of ASBVd.* (4 points)
2. The seed (fruit) must be harvested from healthy trees and must not be soiled. (1 point)
3. When seeds are removed from fruit of a known origin they should be heat treated at 50 °C for 30 minutes or immersed in a 0.5% Oxyacid™ (hydrogen peroxide) solution for 30 seconds to protect the seed against *P. c.* (2 points)
4. After treatment the seed has to be dipped in a broad-spectrum fungicide. (1 point)
5. If the seed is stored before heat treatment, it has to be placed in clean bags and stored at approximately 5 °C. (1 point)
6. Bud wood and rootstock material must be taken from approved and indexed trees selected for vigour, productivity and health status and must be free from ASBVd. (4 points)

The planting area (21 points):

1. The filled plant bags must at all times be kept above soil level and transported in previously sterilised wheelbarrows / carts from the filling area to the planting area. (2 points)
2. The bags may not touch the soil before they leave the nursery. And no persons are allowed to step onto the platforms. (2 points)
3. Bags must have enough holes - up to 50% of the bottom surface area - for sufficient drainage. (2 points)
4. Bags may not be used more than once. (2 points)
5. Monoculture is preferred. If other subtropical crops are propagated in the same nursery, the standards as set out in ANA NIS are applicable to these plants. The inspection procedure will include these crops. (3 points)
6. Weak plants must be removed from the nursery and destroyed away from the nursery, as they are a potential source of *P. c.* contamination. (2 points)
7. Old, healthy plants (+12 months after planting date) should be kept separate from younger plants in the nursery, as they are also a potential source of *P. c.* contamination. (2 points)
8. The area should be cleaned regularly and be free of weeds. (2 points)



9. The pathways in the nursery must be sterilized monthly e.g. sprayed with 1% copper sulphate solution. (2 points)
10. As soon as plants leave the nursery, the structures on which they stood must be cleaned and sterilized before other plant bags are placed on the site. (2 points)

General nursery procedures (20 points):

1. Plants from another nursery must not be brought into the nursery area. (2 points)
2. Vehicles must where possible not be allowed to go into the fenced area of the nursery. A drive-through bath containing a suitable sterilizing solution should be used if vehicles have to drive into the nursery area. (2 points)
3. Visitors should be limited and not be allowed to enter the in the nursery unaccompanied. (2 points)
4. The Nursery must comply with all the regulations as described by the Directorate of Plant Health and Quality. (2 points)
5. Nursery regulations and the latest star rating must be displayed at the main entrance. (2 points)
6. Roots, tree size and tree condition should be regularly randomly inspected per batch to make sure they meet the APIS minimal requirements for a certified tree when ready for sale. (6 points)
7. Batches should be kept as uniform as possible. (4 points)

Administration (10 points):

1. Prove that the Nursery is registered at the Department of Agriculture's, Directorate of Plant Health and Quality; a copy must be available for the SAAGA officer. (2 points)
2. A detailed list (area sold + cultivar + rootstock) of all tree sales should be at the SAAGA office (July-June). (2 points)
3. Each row in the nursery should be numbered. (2 points)

The following data should be indicated with each row:

4. Big bag planting date. (2 points)
5. Cultivar & rootstock. (2 points)



ANA STAR RATING SYSTEM FOR AVOCADO NURSERIES

The star rating system are used and stars are displayed on the accreditation certificate. The star grading system is managed according to a percentage value. *P. c.* control in the nursery is one of the most important issues. Therefore, this point is measured separately to a value of 20. If a nursery scores full marks out of the total of 80 points for all other aspects and 0 points due to *P. c.* contamination (> 20 % *P. c.* infection per sample where each sample represents a batch or row), then the nursery can only qualify as a three star nursery. The nursery can score 20 points for contamination < 10 % and scores 10 points for *P. c.* contamination between 10 - 20 %.

STAR RATING CATEGORIES

One star: The nursery achieved 21 - 40% according to the rating scale as set out in the ANA NIS section of this document. **Two star:** The nursery must achieve at least 41 - 60% according to the rating scale as set out in the ANA NIS section of this document. **Three star:** The nursery must achieve at least 61 - 80% according to the rating scale as set out in the ANA NIS section of this document.

Four star: The nursery must achieve at least 81 - 90% according to the rating scale as set out in the ANA NIS section of this document. **Five star:** The nursery must achieve at least 91 - 100% according to the rating scale as set out in the ANA NIS section of this document.

A list of Accredited Nurseries (3-5 star nurseries) will be published in the quarterly Subtrop Journal.

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Logo explanation:

