

SYNOPSIS OF 1976/77 AND PROPOSED FUTURE AVOCADO RESEARCH BY THE CITRUS AND SUBTROPICAL FRUIT RESEARCH INSTITUTE, NELSPRUIT

A. ENTOMOLOGY

A.1 *Quarantine treatments for export of avocados:*

As a result of the potential for certain new overseas export markets, fumigation trails are being carried out with EDB, for control of fruitfly and false codling moth. Trial insects are being reared and special fumigation equipment has been installed. Field populations of these pests will also be monitored.

B. STORAGE AND TRANSPORT

B.1 *Na-oes hantering:*

Proewe ter verbetering van die kwaliteit van ons vrugte op die uitvoermarke duur voort. 'n Aantal belowende middels word getoets teen na-oes bederf en daar word gekyk na die invloed van voor-oes aspekte (soos byvoorbeeld die gesondheid van die borne) op die goedhouvermoe van die vrugte. Faktore soos die opbou van gasse in 'n opbergingsruim waarin avokado's verskeep word, word ook ondersoek. Hierbenewens word die makKke oliebestelingsmetode, wat by hierdie Instituut ontwikkel is, verder afgerond en aanduidings bestaan reeds dat die nuutste metodes baie meer doeltreffend is wat tot op datum die geval was.

C. FERTILIZATION

C.1 *Navorsing ten opsigte van avokado bemesting:*

'n Bemestingsproef om die reaksie op N, P & K te bepaal, is al sedert 1968 te Burgershall aan die gang. Weens die feit dat hoegenaamd geen reaksie op bemesting aldaar verkry word nie, is proewe onlangs te Friedenheim op 'n sanderige grond, laag in P en K, aangeplant. Aandag word ook gegee aan tegnieke van blaarmonsterneming en die bepaling van optimale norme vir beide blare en grond. Die blaarontledingsdiens vir avokado produsente blyk dan ook van groot waarde te wees veral in soverre dat onnodige en onoordeelkundige bemestings toedienings uitgeskakel word. Verder dra dit baie by tot die bekamping van grondversuring en mikroelement tekorte soos sink en boor. Gedurende 1977 is 303 blaare 217 grondmonsters vir produsente ontleed en bemestingaanbevelings, gebaseer op die resultate, gedoen.

D. PATHOLOGY

Two major diseases are currently receiving attention, *i.e.* Sunblotch and *Phytophthora* root rot.

D.1 *Sunblotch*:

This research is primarily aimed at obtaining a rapid reliable method of indexing for this disease. This is of particular importance as the disease is seed transmitted and it could be rapidly spread by a nursery using rootstock seed from a hidden carrier.

The directions taken in this research are, firstly, a search for biochemical aberrations caused by the presence of the disease, for example in enzyme and phenol levels; and secondly, by determining physical growing conditions under which various indicator cultivars will most rapidly express symptoms.

D.2 *Phytophthora* root rot:

A very wide range of trials are being conducted by the CSFRI to research various aspects of root rot and its control.

D.3 *Laboratory trials*:

Various chemicals are being screened for their efficacy in controlling the fungus, not only with respect to their chemical action, but also as regards their physical attributes which could affect their efficacy.

D.2.2 Pot trials:

The several fungicides which showed promise in the laboratory are then tested in pot trials where the soils are infected with high levels of inoculum.

Pot trials have also been used to assess the efficacy of various soil sterilization methods, both chemical and physical for use on replant sites as well as for nursery soils. From this work it appears that steam is best and the chemical sterilants Basamid, methyl Bromide and Vapam can be rated in effectiveness in the above order for use in nursery soils. The selection of chemical sterilant will, however, depend on product registration and physical requirements.

The influence of soil pH and Ca⁺⁺ levels on severity of infection and root loss is currently being tested in pot trial.

D.2.3 Field trials:

At present the CSFRI is conducting 5 field trials, mainly to test the most promising fungicides available, but also to test the effect of cutting back and calcium applications in diseased orchards.

While in most respects it is too soon to give conclusive results it would appear that several fungicides have definite promise.

D.3 *Miscellaneous feeler trials:*

Various trails are being carried out in laboratories and glasshouses to test and evaluate new ideas and techniques.

D .3.1 Etiolation of cuttings:

Due to the importance of this technique in reproducing resistant rootstocks research is in progress to initiate a demonstration "nursery" not only to familiarize nurserymen with the technique, but also in an effort to anticipate and eliminate disease problems which might arise.

New grafting techniques are also being investigated as well as alternate methods of vegetative reproduction of resistant rootstocks.

D.3.2 New resistant rootstocks:

While we accept that the resistant rootstocks for the immediate future will be the American imports of Duke 6 and 7 and G6, a search is nevertheless being made for local resistant selections. Furthermore duke seed has been irradiated and several resultant mutants (?) are showing promise in screening trails.

Duke 6 and 7 seed are being tested to ascertain their resistance as compared to that of the parent material vegetatively reproduced.

D.3.3 Nursery and cultural practices:

A model demonstration nursery has been built which embodies all the principles of disease free tree production. This nursery, at the CSFRI, Nelspruit is specifically designed for grower education and it is open to visitors at all times.

Further to this, water from the Crocodile River is being monitored weekly to assess its level of pollution (by mud and organic matter), the Cl⁻ binding capabilities of this water is also being evaluated. The effect of gamma irradiation on the microflora of irrigation water is being investigated to assess the radiation dosage required to free the water of pathogens.

E. BIOCHEMICAL AND PHYSIOLOGICAL RESEARCH

E.1 *Graft incompatibility* (Laboratory studies)

Graft incompatibility and *Phytophthora* root rot in avocado trees are principally distinguished by their visual symptoms, which can be most confusing in the majority of cases. In order to establish a more reliable method of diagnosis a comprehensive;

biochemical research programme was undertaken.

Phytophthora infection of avocado roots is characterised by a decrease in the activity of the peroxidase (PO) enzyme activity of the leaves, resulting in a fading of two isoenzymes shown on polyacrylamide gel electrophoresis. PO activity in the leaves from trees with poor graft union did not change considerably compared with healthy trees, which was also reflected in their isoenzyme patterns. The PO activity of the rootstock bark of poor graft union trees was highly activated whereas the scion bark was not affected, which is the opposite effect found with virus infection (da Graca). The most significant result obtained by us recently is that the anthocyanidin extracted from avocado leaves, were responsible for the inhibition of the PO enzyme activity. This lead us to the testing of the anthocyanins (red pigments) in avocado trees. The results at present show that the total anthocyanins in the leaves of *Phytophthora* infected trees were significantly higher compared with healthy trees whereas the values for graft incompatible trees were significantly lower than healthy tree leaves. By using this as a standard test on trees in the orchard it appears that we can now distinguish between graft incompatibility and *Phytophthora* root-rot. This investigation will now be continued with nursery trees.

E.2 Fisologies (Veld proewe)

Verskillende navorsingsaktiwiteite in verband met Tuinboukundige aspekte van die avokado.

Vegetatiewe voortplanting

- (a) Steggies — min sukses
- (b) Etiolering — suksesvol
- (c) Luginleers — min sukses
- (d) Wortelenting — geen sukses tot op hede
- (e) Verskillende enthoogtes — goeie resultate
- (f) Ontkiemingstudies — Definitiewe patroon met ontkiemingspotensiaal van Verskillende varieteite.

Abnormale entverbindinge

Die aanwesigheid van skurwe bas op die onder-stam is opvallend by swak borne wat tussen gesonde borne groei en wat tipiese wortelvrot (*Phytophthora* *namomij*) simptome toon. Skurwe bas kan geassosieer word met of swak entlas of onverenigbaarheid en het 'n betekenisvolle peroksidase ensiem aktiwiteit in beskadigde weefsel gegee.

Verdere ondersoek word gedoen met die klem op kwekery toestande vir die bepaling van betekenisvolle verskille in peroksidase aktiwiteit in die bas van kombinasies van Verskillende cultivars.

Cultivars

Altesaam 16 nuwe cultivars is aangeplant onder andere 6 plaaslike seleksies en 10 ingevoerde cultivars. Meer as die helfte sal gedurende 1978 vrugte produseer en vrugkwaliteit sowel as aanpasbaarheid word ondersoek. 'n Verdere ses ingevoerde cultivars is tans onder kwarantyn.

Verbouing

Belangrike verbouingsaspekte soos plantafstande en snoei van gevestigde boorde geniet aandag en proewe is beplan.