

CURRENT STATUS OF THE AVOCADO BREEDING PROGRAMME

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ABSTRACT

This is the second report on the breeding programme of the ITSC and reports on the reestablishment of the new genesource, the Phase I plantings. A description is given of the material selected from Phase I for inclusion in a Phase II programme. The progress made with regards to the controlled pollination programme is also reported.

INTRODUCTION

The new breeding strategy was introduced at the Institute for Tropical and Subtropical Crops (ITSC) of the Agricultural Research Council (ARC) after a visit of Dr. Du Plooy, in 1991, to California. This strategy and the necessity for a local breeding programme on avocado were discussed in detail by Du Plooy, Marais & Sippel (1992). The total breeding programmes from introduction of new material through to cultivar release were reported on by Bijzet, Sippel and Koekemoer (1993). Currently the South African avocado breeding programme is jointly run by the ITSC, Merensky Technological Services and Westfalia. This joint programme is given in Fig. 1.

RESEARCH PROCEDURE

The work programme consists primarily of five parts which can be summarized as follows:

1. New introductions
2. Evaluation and consolidation of the gene source and the newly introduced material
3. Selections originating from open pollination
4. Selections made from self and cross pollinations
5. The testing of promising selections for cultivar status

The incorporation of new material in the gene source is continued through the importation of material from other countries as well as promising material found in gardens and on farms in South Africa. The genesource will be evaluated regularly according to the breeding objectives in order to dispose of material that is worthless to the breeder. The same will apply to newly introduced material. For the short term programme open pollinated seed are planted at an approximate rate of 1250 a year. These are screened by means of a Phase-I form.

For controlled crosses are top worked with two cultivars and at flowering enclosed in

order to facilitate cross pollination by means of bees. Trees in pots have been planted, to be used as pollinator donors in cages. As many seeds as possible, obtained from fruit in these cages will then be planted. The seedlings that originate from these seeds will then be screened by means of isozymes to determine whether they are a result of self or cross pollination as each cage can theoretically result in four different combinations for example:

When cultivar A and cultivar B are enclosed together the fruit picked from the A branch can either be: A x A or A x B where B was the pollinator and the fruit picked from branch B could then be: B x B or B x A where A was the pollinator. Thus four combinations namely:

$$\begin{array}{ll} A \times A & A(\varphi) \times B(\sigma) \\ B \times B & B(\varphi) \times A(\sigma) \end{array}$$

The Phase-I seedlings of both the short and long term programme will take approximately four to five years to start bearing for the first time. These will then be screened and the best selections will then be identified. This selected material will then be included in a Phase-II evaluation which for practical purposes is registered as a separate project. The best selections from the Phase-II evaluation will then be considered for cultivar status.

GENESOURCE

A consolidated genesource was established during January 1994 in orchard L7 at the Nelspruit Research Station of the ITSC. This genesource currently consists of 41 cultivars, 17 rootstocks and 12 selections planted in two tree replicates. This gene source will constantly be updated in order to include all the possible breeding material in the industry.

PHASE I EVALUATION

As the only existing seedlings to be evaluated in Phase I are 200 seedlings of open pollinated sources. These trees are located at the Burgershall Research Station and were planted in 1987. After girdling of these trees in 1991, some of the trees bore fruit that could be evaluated. This was done according to the Phase I evaluation form and six selections were identified: one each of Ettinger and Wurtz and two each of Edranol and Hass. Two of these selections namely the Wurtz and one of the Edranol seedlings are already incorporated in the Phase II evaluation programme and will henceforth be respectively called 87-7/1 and 8717/1. The other four selections were included during 1993 and are in the process of being multiplied. It was decided that these 200 trees were fully exploited and can now be eliminated. This small planting of 200 trees had however in showing a great degree of variation and promising characteristics emphasised the importance of a well documented breeding programme. A large degree of variation is already visible among the seedlings from the 1991 and the 1992 season. In Fig. 2 the variation among the one year old trees is clearly visible.

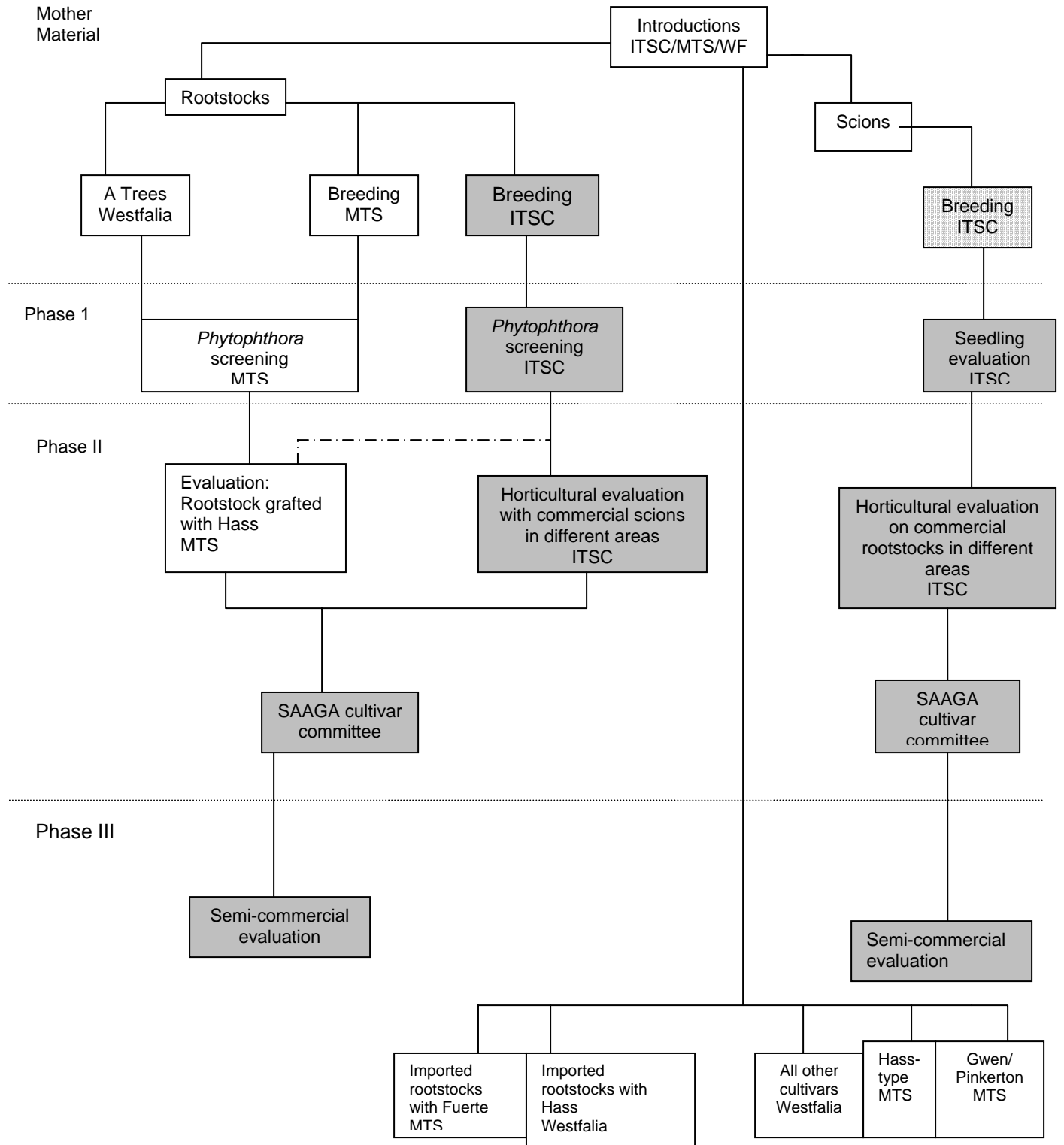


FIG. 1. The South African breeding programme, jointly run by Westfalia, Merensky Technological Services and The Institute for Tropical and Subtropical Crops.



FIG. 2
Visible variation in a one year old Phase I orchard.



FIG. 3
Self pollinated seedlings in the nursery



FIG. 4
Trees in pots to be used as pollinators in cages

TABLE 1

Number of seed collected during 1993 and the number of seedlings that have been planted from these collections.

Harvest Year	Seed Collected	Seed Planted	Seedlings Germinated	Transplanted	Survived
Open pollinated seed collected					
1993	1296	1259	1002	Not Available	Not Available
Self pollinated seed collected					
1993	50	48	39	Not Available	Not Available

POLLINATION PROGRAMME

In Table 1 a report is given on the seed collected during 1993 from open pollinated and self pollinated sources. The number of seeds germinated could still rise as there are still seeds that are in the process of germinating. These seedlings will however be marked as being late germinators and this will be correlated later to specific characteristics.

The success rate of self pollination was not very satisfactory as can be seen in Table 1. A germination rate of 81% was, however, obtained and these trees look healthy and exhibit vigorous growth in the nursery, as can be seen in Fig. 3. The self pollination programme will be continued, and the possible problems in connection with this mode of pollination will be investigated and rectified.

The first step towards the implementation of the controlled cross pollination programme was taken when 116 trees had been planted in large pots, during September 1993, to be used as cross pollinators. (Fig. 4) Trees will also be cut back and topworked during 1994 and 1995 to facilitate the cross pollination programme.

CONCLUSION

Since 1991 a total of 3774 seeds have been planted for a Phase I scion evaluation of which 78 are self pollinated. This is an average of 1258 seedlings planted each year which complies with the annual number of 1250 seedlings that have to be planted each year. From the existing 200 seedlings, six have already been identified as promising. The controlled pollination programme was successfully initiated and will be expanded. Progress has been made at a steady rate since the new breeding programme, based on the strategy that was compiled in 1991, was implemented.

The necessity and implementation of a local breeding program for avocados in South Africa cannot be over emphasized. The reasons for this were out-lined on various occasions. The Institute has already most of the promising material from other breeding programmes available and with the infrastructure and knowledge that are available at the ITSC.

REFERENCES

- DU PLOOY, C.P., MARAIS, ZELDA. & SIPPEL, A.D. 1992. Breeding and evaluation strategy on Avocado. *South African Avocado Growers' Association Yearbook 16*: 75-77
- BIJZET, ZELDA. SIPPEL, A.D. & KOEKEMOER, P.J.J. 1993. Avocado breeding: A progress report. *South African Avocado Growers' Association Yearbook 16*: 86-89