

ALLESBESTE NURSERY: BREEDING AND SELECTION IN SOUTH AFRICA – AN INTEGRATED APPROACH

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The evaluation of imported as well as locally found by-chance selections are integrated with the evaluation of material from Allesbeste's own breeding programme. The programme is divided into three phases. Seedlings of open pollinated Hass were initially planted in the phase 1 block. Promising selections are top worked for further evaluation in the phase 2 block on stag horned Duke 7 rootstock trees. Selections with commercial value (from phase 2) are finally evaluated in semi commercial blocks. Seedlings of these promising selections (Hass phenotypes) are screened and reintroduced annually to phase 1. Promising selections identified are W1 (green skin); Q23, K6, I3, Q30, F1, F2, F3, H1f2, DA8, F5, Q19, O3, O2B, R1, D1, W4, C1, Q22 and Humor (dark skins). The season of C1 and Q22 are similar to that of Hass whereas D1 and DA8 are substantially later than Hass. C1 has a high precocity, produces high yields and can be manipulated to set an out of season crop. The harvest period of F1 can be delayed for several months. F5, W4 and D1 are similar to Hass in taste (nutty) and appearance. Q22 has a good flesh colour and texture with a unique and well-accepted sweetish taste. Q22 has an excellent shelf live. Humor shows very good storage abilities. Maluma Hass was the first to be released with full cultivar status from the programme. It outperforms Hass on production and count distribution. Allesbeste Nursery holds the plant breeder's rights for Maluma Hass under registration number ZA 20043215.

Key words: Evaluation, programme, three phases, open pollinated, imported, by-chance, commercial value, released.

VIVERO ALLESBESTE: PRODUCCIÓN Y SELECCIÓN EN SUD AFRICA – UN DESARROLLO INTEGRADO

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La evaluación de selecciones importadas tanto como las encontradas a nivel local, está integrada con la evaluación de material del programa reproductivo de Allesbeste. El programa está dividido en tres fases. Se plantaron en un principio plántulas Hass polinizadas abiertas en el bloque de fase 1. Se injertan selecciones prometedoras para evaluación en fase 2 en árboles con marchitez descendente de portainjerto Duke 7. Selecciones con valor comercial (de fase 2) son finalmente evaluadas en bloques semi-comerciales. Plantas de estas selecciones (fenotipos de Hass) son inspeccionadas y re-introducidas

anualmente a fase 1. Las selecciones prometedoras identificadas son W1 (cáscara verde), Q23, K6, I3, Q30, F1, F2, F3, H1f2, DA8, F5, Q19, O3, O2B, R1, D1, W4, C1, Q22 y Humor (cáscaras negras). La estación de C1 y Q22 es semejante a la de Hass, mientras que D1 y DA8 son substancialmente más tardías que Hass. C1 tiene precocidad alta, produce cosecha alta y puede manipularse para producir un cultivo fuera de la estación. El periodo de cosecha de F1 puede retrasarse por varios meses. F5, W4 y D1 son semejante a Hass en gusto (a nueces) y apariencia. Q22 tiene pulpa de buen color y textura con un gusto único y bien aceptado que tiende a ser dulce. Q22 tiene una excelente capacidad de conservación. Humor muestra una muy buena habilidad para ser almacenada. Maluma Hass fue el primero en liberarse con estatus completo de variedad (cultivar) de este programa. Esta variedad (cultivar) supera a la variedad (cultivar) Hass en áreas de producción y distribución de tamaños. Vivero Allesbeste tiene los derechos de obtentor de plantas para Maluma Hass bajo número de registro ZA 20043215.

Palabras clave: Evaluación, programa, tres fases, polinizados, importadas, tanto como, valor comercial, liberarse.

1. Introduction

Hass, a predominantly Guatemalan but with some Mexican genes, was selected in 1926 by Mr Rudolph Hass at La Glabra Heights, California as a chance seedling of unknown parentage due to its high flesh quality, higher yield and later maturity than Fuerte. Although a patent was granted in 1935 it had taken 15% of the market in 1957 to only surpass Fuerte forty years after its introduction (Bijzet, 2001; Newett *et al*, 2002). In the last 50 years Hass has become the dominant cultivar grown in subtropical climates and in 2000 accounted for 96% of the production in New Zealand, 90% in California and Mexico, 80-85% in Chile, 73% in Spain, 70% in Australia, 31% in South Africa and 27% in Israel. However, Hass has the tendency to bear large numbers of undersized fruit (< 200g) and the percentage of small fruit increases as the trees age or health deteriorates (Newett *et al*, 2002).

The post harvest features that contribute to the popularity of Hass are its excellent storage and shipping ability when compared with most other cultivars. The change in skin colour from green to black provides an easy index for ripeness and masks minor rind imperfections (Newett *et al*, 2002).

According to Bergh (1961), during a breeding and selection programme the most important tree characteristics are precocity and a high consistence yielding ability. Based on the experience of Lahav and Lavi (2002) for the genetic improvement of the avocado, unless a specific objective is required, open-pollination is preferred to controlled-pollination, because the latter is expensive and has no advantages.

The objective of the study is to search for a Hass-like cultivar either to address the shortcomings of Hass or to extend the Hass season. This objective is

supported by the desperate need for the South African avocado industry to not only find a more productive Hass with a better size distribution, but also to extend its export as well as its local season, so as to fulfill the 12 month requirement for its ripe-and-ready programmes.

2. Material and Methods

A Breeding and selection programme with an integrated approach was designed and implemented during the early 1990's at Allesbeste nursery (Fig. 1). Allesbeste nursery is a leading clonal avocado nursery in South Africa, situated in the Letaba region of the Limpopo Province.

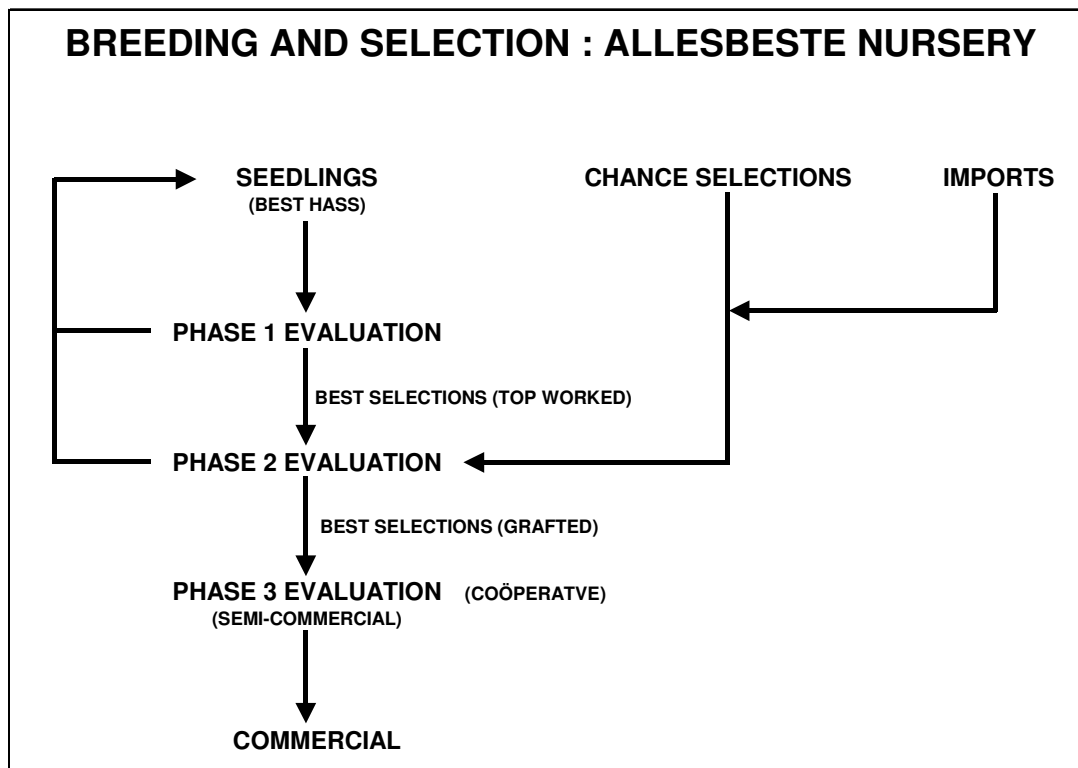


FIG. 1 A diagrammatic representation of the integrated breeding and selection approach at Allesbeste nursery.

The evaluation of material from Allesbeste's own breeding programme is integrated with imported as well as local chance selections. The programme is divided into three phases. Open pollinated seeds from Hass, Hass phenotypes (seeds from Phase 1 and 2) and Maluma Hass[®] are collected, germinated and screened in the nursery to be planted out in the Phase 1 block. Promising selections (from Phase 1) are top worked for further evaluation in the Phase 2 block on stag horned Duke 7 rootstock trees. The selections with commercial value (from Phase 2) are then established as grafted nursery trees in semi commercial blocks (Phase 3) for final evaluation before considering the

commercial release thereof. Local chance selections as well as imported material are drawn into the programme by top working trees in the Phase 2 block (Fig. 1). Where applicable, plant breeder's rights are protected.

Since the early 1990's thousands of seeds were germinated and introduced to Phase 1. The fruit of the producing trees are subjected to a very detailed evaluation. The information documented includes among others, precocity, annual bearing (non alternative); the shape, length, diameter, uniformity, weight and moisture content of the fruit; skin texture, thickness, lenticel appearance and colour and tightness when ripe; the characteristics of the pedicel; seed shape and size, seed : fruit flesh ratio; flesh colour, texture and taste; days to ripen, season (early, mid or late), storage and shelf life. Fruit quality is evaluated with regard to resistance to common disease and pests, proneness to mechanical damage as well as the occurrence of internal physiological disorders. The characteristics of all selections are measured against that of Hass, obviously trying to improve on the weaknesses thereof. Selections, not necessarily perfect, but showing certain improved genetic characteristics compared to Hass, are also identified and if found to be of any value, introduced to Phase 2. Although the main aim is to find an improved Hass-type, green skin selections with potential are also considered.

3. Results and Discussion

Since the commencement of the breeding and selection programme one green skin and thirty-two black skin selections were introduced to Phase 2 evaluation. Promising selections identified are W1 (green skin), Q23, K6, I3, Q30, F1, F2, F3, H1f2, DA8, F5, Q19, O3, O2B, R1, D1, W4, C1, Q22 and Humor (all dark skin).

Both C1 and Q22 follow more or less a similar maturity trend as Hass, whereas D1 and DA8 reaches the same moisture level (73%) 22 weeks later than Hass. Both D1 and DA8 have the potential to extend the harvest season. C1 has a high precocity, produces high yields and can be manipulated to set an out of season crop. Although affecting the next crop the harvest of F1 could be delayed for several months as it hangs extremely well. F5, W4 and D1 have a nutty taste and a fruit appearance very similar to that of Hass. Q22 has a good flesh colour and texture with a unique and well-accepted sweetish taste. Humor shows very good storage ability.

Maluma Hass[®], a local chance selection, was the first to be released with full cultivar status from the programme. This early Hass-type cultivar has a high precocity and produces extremely well. It outperforms Hass on production and count distribution. Allesbeste Nursery holds the plant breeder's rights for Maluma Hass[®] under registration number ZA 20043215.

4. Conclusions

According to the results so far the breeding and selection program of Allesbeste Nursery seems very promising. Although at a very early stage the dark skin selections like F1, DA8, F5, D1, W4, C1 and Q22 and the green skin selection

W1 have potential. The chance selection Humor has good storage ability while Grace has a good taste and seems to be complimenting the latter part of the Hass season.

Maluma Hass[®], a local chance selection was the first to be successfully released from the programme (end 2006) with full export cultivar status. Maluma Hass, being an early fruiting cultivar, can successfully extend the Hass season by one month. Allesbeste Nursery holds the plant breeder's rights for Maluma Hass[®] in South Africa under registration number ZA 20043215. The registration for plant breeder's rights is pending in New Zealand and Australia.

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