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ROOTSTOCKS FOR PEACHES AND NECTARINES

The correct cultivar on the most suitable rootstock, for specific conditions, is an important requirement for peach producers. The producer must make this choice early and inform the nursery in good time so that high quality, well matured trees with optimal reserves are available. Producers must plant these trees in winter while still dormant to promote early root development.

In South Africa there are presently 1317 ha dessert peaches, 7422 ha clingstone peaches and 1619 ha nectarines under cultivation (OABS, 2006). Fruit is cultivated over wide areas, especially in the Western Cape, Mpumalanga, Limpopo, North-West Province and the Free State, and in the other provinces. Hence peaches are cultivated over a wide range of climatic conditions. There are areas with 200 cold units and less, and those with 1000 and more.

There are also differences in the soils (shale, sandy, sandy loam, heavier clay, shallow soils and soils with high salinity, i.e. brackish soils, soils that are prone to be wet, and soils with a high free-lime content, as well as soils infested with certain soil-borne diseases and nematodes). Scion cultivars are vital, but in order to optimise the performance of a tree it must be supported by the most suitable rootstock.

Stassen (2007) has given a detailed review of the actual performance of all rootstocks in South Africa, evaluated under certain defined conditions. The most important aspects are summarised in this brochure.

ROOTSTOCK INFORMATION

It should be noted that it is not always possible to generalise because of the differences in cultivars, climate and soil types.

Tables 1 and 2 present available information relative to Kakamas seedling rootstock. Overseas results have been used to supplement certain aspects.

It must be stressed that there is no superior rootstock suitable for every situation. The best rootstock is the one adapted for a specific situation.

Fig 1
Chlorosis of peach scion cultivar on Flordaguard rootstock in free-lime soils at Robertson

Fig 2
Peach trees on SAPO 778 that decline due to secondary fungus infection

Table 1 Rootstocks for peaches and nectarines (compared to Kakamas seedlings as standard)
(Note the specific conditions that apply.
No resistance exists to ring nematodes that is also becoming a problem.)

Rootstock	Accumulated yield efficiency (yield/ stem circumference, over years)	Fruit mass (g)	Vigour (stem circumference)	Nematode susceptability (field observations and as provided by literature)
Kakamas seedling	Good	Good	Vigorous	Very sensitive
SAPO 778 clone	Good to better	Very good	Vigorous to very vigorous	Moderately resistant
GF 667 clone	Good to very good	Good	Vigorous	Very sensitive
Flordaguard clone	Good	Good to very good	Very vigorous	Resistant to most root-knot nematodes (overseas results)
Viking clone	Good to very good	Very good	Vigorous to very vigorous	Resistant to certain root-knot nematodes (overseas results)
Atlas clone	Good to better	Very good	Vigorous to very vigorous	Resistant to certain root-knot nematodes (overseas results)
Cadaman clone	Good	Good to very good	Vigorous to very vigorous	Resistant to certain root-knot nematodes (not *M. javanica*) but sensitive to lesion nematodes that are especially present in old vineyard soil (overseas results)

Fig 3
Peach bud development after budding on a spesific rootstock in the nursery. It is important that the choice of rootstock must be done early enough for the nursery to have the desired rootstock available for budding in the early summer

Fig 4
Alpine fruit on Viking rootstock Viking has a positive effect on fruit mass

Table 2 Rootstocks for peaches and nectarines (compared to Kakamas seedlings as standard)
(Note the specific conditions that apply.)

Rootstock	Soil suitability	Remarks
Kakamas seedling (St Helena-seedling, RSA)	Sensitive to wet conditions and free lime. Plant in good, deep, well-drained soil.	Has been the standard rootstock for peaches and nectarines in SA. Other peach seedlings have also found wide application in other areas of the world.
SAPO 778 clone [Siberian C *(Prunus persica x P. amygdalus*, USA)]	Excellent under good management practice. Trials show that this rootstock is (relatively) more resistant to wet conditions. Factors affecting root growth may cause the induction of water logging and dieback may occur.	Causes delayed budbreak symptoms (leaf yellowing and delayed foliation) on scion cultivars in warm areas and with some early cultivars. Symptoms are more serious when winters are warm, and in very warm areas. Siberian C parent is resistant to cold but drought sensitive.
GF 667 clone *(Prunus persica x P. amygdalus*, France)	Very suitable in free-lime soils. Sensitive to wet conditions. Moderately brack resistant.	Tolerates drought reasonably well (overseas results).
Flordaguard clone *(Prunus persica x P. davidiana*, USA)	Very sensitive to wet conditions and free lime. Suitable for well-drained sandy (lighter) soils.	Has a low cold requirement and is precocious. Has better nematode resistance than Nemaguard. Nemaguard has a higher chilling requirement than necessary for very warm areas (overseas results).
Viking clone *(Prunus persica x P.davidiana x P. dulcis x P. blireiana*, USA)	Somewhat tolerant of periodic wet conditions. Moderately resistant to free-lime and brack conditions. Relatively resistant to *Phythopthora cactorum* but not to *P. megasperma*.	Good for replant situations, productive and precocious (overseas results). According to American results, sensitive to drying out at planting.
Atlas clone *(Prunus persica x P. davidiana x, P. dulcis x, P. blireiana*, USA*)*	Sensitive to wet conditions. Less sensitive to brack conditions and free-lime than ordinary peach seedling.	Not precocious. May delay maturity by a few days. Sensitive to drying out at planting (overseas results).
Cadaman clone *(Prunus persica x P. davidiana*, Hungary and France)	Very suitable in free-lime soil with high pH. Sensitive to wet, but resistant to brack conditions. Also known as Avimag.	Good in replant situations and productive. Sensitive to drying out at planting. Stronger growth during the first 4 years (overseas results).

CONCLUSIONS AND RECOMMENDATIONS

Kakamas seedling has served as a mainstay rootstock for many years. There are certainly still situations in which this rootstock will be used (high potential, well-drained soils, without limitations). The sensitivity of this rootstock to root-knot nematodes and waterlogged conditions, and the effect on fruit size, must however be considered. Over a long period a good deal of selection has taken place with Kakamas seedling that has reduced variation, but clonal rootstocks can still provide better uniformity and, in most cases, better fruit size, which offers a great advantage, especially in warm areas and with early cultivars. Kakamas seedling is less vigorous than SAPO 778 and most other rootstocks recommended for peaches.

SAPO 778 clone has clear advantages over Kakamas seedling with respect to fruit mass. Kakamas seedling is less vigorous than SAPO 778. When SAPO 778 is recommended it must be taken into consideration that the rootstock has a delayed foliation effect on the scion and that in certain seasons, in very warm areas, this may present problems. The rootstock is sensitive to conditions that adversely affect root development. The rootstock is less sensitive than Kakamas seedling to certain nematode species. With modern, finer fertigation applications, or drip irrigation, the rootstock should perform very well. Under less favourable management practices however, heavier and shallower soils should be avoided. The rootstock may delay ripening of early cultivars by a few days. A high priority is given to this rootstock for peaches.

GF 677 is an outstanding rootstock for free-lime, high pH soils, and also for mildly brackish conditions. The rootstock is sensitive to root-knot nematodes. The rootstock is less suitable to soils that may experience wet conditions. Yield efficiency is better than that of Kakamas seedling, especially in free-lime soils. This rootstock is of similar vigour to Kakamas seedling. Fruit mass is similar to that obtained with Kakamas seedling but poorer than with Viking and SAPO 778 clone, as well as that obtained with Cadaman, Flordaguard and Atlas. Ensure that tree yield is determined according to potential to improve fruit mass. GF 677 shows no chlorosis in soils where free-lime is a serious problem. No leaf scorching symptoms are apparent under mildly saline soil conditions.

Flordaguard is a good rootstock in sandy soils and resistant to most root-knot nematodes that occur in many South African soils. It is a more vigorous rootstock than Kakamas seedling. Attention must be given to summer pruning. Fruit mass is better than with Kakamas seedling as rootstock. This rootstock is not suitable for use in free-lime soils and under waterlogging conditions. It can however be used with confidence in many of the deep, well-drained sandy soils that occur widely. In the past it has been found that there is some resistance towards rootstocks such as Nemaguard. Limitations include wet sensitivity, higher vigour, and sensitivity to high free-lime (high pH). If the limitations are evaluated then there is a place for a rootstock such as Flordaguard because widespread root-knot nematode infestations occur throughout South Africa (Storey, 2006) and presents one of the most serious limitations with respect to especially fruit size, but also yield. The fact that the rootstock has red leaves makes identification easier. Rooting is very easy and cuttings bud early, which allows them to be budded earlier. This rootstock will grow vigorously in high potential soils. On such soils it will however not outperform SAPO 778 or even Kakamas seedling. This aspect must be taken into account with summer pruning. This rootstock has a low chilling requirement and is suitable for warmer areas.

Viking has definite possibilities for soils with medium lime content and for somewhat heavier soils, but is less suitable on lighter sandy soils. The rootstock yields fruit masses similar to the SAPO 778 clone. Yield efficiency is better than that of Kakamas seedling, but it is more vigorous. According to overseas results Viking is resistant to root-knot nematodes. The rootstock is less sensitive to stress

Fig 5
Fungus infection on the scion with SAPO 778 rootstock in heavier soils

Fig 6
Delayed foliation symptoms with 'Alpine' nectarine on SAPO 778 rootstock in very warm area

conditions than Kakamas seedling and SAPO 778 clone. No die-back has yet been recorded under periodic waterlogging conditions, although trees do die-back in cases where the water table is high. It is also suitable for moderate brackish conditions and moderately lime-rich soils. When taking all the overseas information into account, it can be said that it is a rootstock with many advantages and wide adaptability. The Americans and Chileans caution however against drying out of this rootstock at planting. Viking and Atlas are from the same breeding programme.

Atlas induces larger fruit and may delay maturity. It is similar to Viking and suitable in moderate brackish and free-lime soils. It is sensitive to drying out at planting.

Cadaman is also suitable for free-lime and higher pH soils. Bearing efficiency is better than Kakamas seedling as rootstock and the same as that of GF 677. Fruit mass is better than with GF 677 and the same as with SAPO 778 clone. According to overseas results this rootstock has moderate resistance to certain nematode species but is sensitive to lesion nematodes that can occur in old vineyard soils. Wet sensitivity can however be a limitation. It is also sensitive to drying out at planting.

Soil suitability can be summarised as follows:

- high free-lime soil: GF 677 and Cadaman
- moderate free-lime soil: Viking and Atlas
- wet conditions and heavier soils:
  Currently all rootstocks are sensitive to waterlogging. Viking is less sensitive to stress conditions associated with periodic wet conditions (Woolridge *et al.*, 1997) but will cause die-back if high water tables prevail over a continued period. SAPO 778 has shown no signs of die-back in periodic wet soils, but additional factors that affect the roots may cause waterlog symptoms. It is also sensitive if high water tables occur for longer periods of time.
- deep, well-drained, poor sandy soils: Flordaguard
- medium to high-potential soils without limitations: SAPO 778 clone, Atlas, Viking, Kakamas seedling
- moderately brackish soils: GF 677, Cadaman, Viking, Atlas
- soils with moderate limitations: Viking
- sandy soils in which root-knot nematode causes serious problems: Flordaguard (manage nematode infection initially)
- other soils (higher potential) with nematode infestation: SAPO 778, Atlas, Viking (Flordaguard will grow vigorously)
- replant: Viking, Cadaman (overseas results)
- sensitivity to wet-feet conditions: Cadaman, Atlas, GF 677, Flordaguard, Kakamas seedling.

Horticultural adaptability:

- increase in fruit mass in suitable soils: SAPO 778, Atlas, Viking, Cadaman, Flordaguard
- increase in yield efficiency: GF 677, Viking, Atlas, SAPO 778
- increase in vigour against Kakamas: Viking, Atlas, SAPO 778, Cadaman, Flordaguard.

Fig 7
Nursery: peach scion on Flordaguard rootstock

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Fig 8
Fantasy scion cultivar on GF 677 rootstock show no symptoms on free-lime and moderate brack soils at Ashton. Trees were not retarded as on Kakamas seedling and SAPO 778

Fig 9
'Alpine' nectarine tree on Kakamas seedling in soil with serious nematode infestation

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