Piet Stassen
ARC Infruitec-Nietvoorbij, Stellenbosch

ROOTSTOCKS FOR PLUMS

The right cultivar on the most suitable rootstock, for specific circumstances, is a necessary requirement for plum producers. The producer must make the choice early and inform the nursery timeously so that high quality, well hardened trees with optimum reserves will be available. Producers must establish the trees in the winter while they are still dormant, to favour early root development.

There are currently 4071 ha plums and 472 ha prunes under cultivation in South Africa (OABS, 2006). Plums are mainly cultivated in the Little Karroo, the Berg River area, and other parts of the Western Cape. Plantings are however also found in the other provinces. Prunes are mostly cultivated in the area around Wolseley and Tulbagh.

Free-lime soil is found in parts of the Little Karroo. Shallow soils and soils subjected to sporadic wet conditions are found in large areas of the Berg River, Stellenbosch and Franschhoek. Sandy soil is generally found in the Wolseley, Villiersdorp and Piketberg area, and stony soil in the Tulbagh area.

Yellow-cling peach seedlings and Marianna cuttings have been used by the deciduous fruit industry for a long time. Marianna is susceptible to bacterial canker (*Pseudomonas syringae*) and this roostock can drastically reduce the lifetime of the plum tree. Peach seedlings are sensitve to crown gall (*Agrobacterium tumefaciens*) and nematodes. An open-flower-pollinated cross of Marianna (8/6) has been released as Maridon (Stadler, Lötze and Acker, 1990). According to Stadler, Lötze and Acker (1990) Maridon roots more easily and was compatable with all Japanese as well as European plums with which it was tested. However, Lötze (1996) later found that the Pioneer plum is not compatable with Maridon and Marianna.

Die-back and dying of plum trees is a widespread phenomenon in the Western Cape. Investigations by Matthee, Thomas and Du Preez (1981) have revealed that there are primarily two main causes of dying. The one is bacterial canker (*Pseudomonas syringae*) and the other is too much soil water. Marianna rootstocks perform well on soils that are well aerated to 200 mm. This can be ascribed to the natural shallow root system of Marianna. Apricot cuttings and peach seedlings, however, require well aerated soil to about 600 mm and soil that is not compacted for effective

Fig 1
Modern palmette trellis system. Trees are stored in cold room for 6 weeks from the nursery and then planted without heading

Fig 2
Plums being weighed and counted

functioning (Terblanche, De Kock and Van Zyl, 1974). Depth restriction is caused by rocks, clay, water tables and layering, as well as low pH and artificial compaction. The possible resistance of Maridon to bacterial canker makes it an important rootstock for plums, and is also the reason for its release (Stadler *et al*., 1990).

Since 2003 a Rootstock Evaluation Committee has been active in the research and evaluation of deciduous fruit rootstocks. This committee enjoys wide representation. Its aim is to promote communication, speed up processes, to integrate information and make it available. The aim of this brochure is, as far as possible, to collate existing information and present it in a simple form.

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

ROOTSTOCK INFORMATION

It should be noted here 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 Marianna seedling as 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.

Table 1 **Summary of rootstocks for plums (compared to Marianna as standard)**
(Note that it is important to plant a rootstock on suitable soil where it will exhibit optimum performance. No resistance exists with current rootstocks to ring nematodes.)

Rootstock	Accumulated yield efficiency (yield/stem circumference, over years)	Fruit mass (g)	Growth vigour (stem circumference, cm)	Nematode sensitivity (field observations and literature)
Marianna (cuttings)	Good	Good	Vigorous	Resistant to immune to root-knot nematodes
Marianna 2 (selection)	Good	Good	Vigorous	Resistant to immune to root-knot nematodes
Maridon	Good	Good	Vigorous to less vigorous	Resistant to immune to root-knot nematodes
SAPO 778 (clone)	Good to very good	Good to very good	Vigorous to very vigorous	Moderately resistant
GF 667 (clone)	Good to very good	Good to very good	Vigorous to very vigorous	Very sensitive
Flordaguard (clone)	Good	Good to better	Very vigorous	Resistant to most root-knot nematodes
Viking (clone)	Good to very good	Good to better	Vigorous	Resistant to certain root-knot nematodes
Cadaman (clone)	Good to better	Good	Vigorous	Resistant to certain root-knot nematodes
Atlas (clone)	Good to very good	Good to very good	Vigorous to very vigorous	Resistant to certain root-knot nematodest

Table 2 **Summary of rootstocks for plums**
(Note the specific conditions that apply)

Rootstock / origin	Soil suitability	Remarks
Marianna cuttings *(Prunus cerasifera x P. munsoniana*, USA*)*	Shallow-growing rootstock. Can tolerate certain wet conditions.	Has been the standard rootstock for plums. Sensitive to bacterial canker.
Marianna 2 (selection)	Shallow-growing rootstock. Can tolerate certain wet conditions.	Selection of Marianna.
Maridon (Marianna progeny, RSA)	Shallow-growing rootstock. Can tolerate certain wet conditions.	Better resistance to bacterial canker. To date, compatible with all Japanese plums except 'Pioneer'.
SAPO 778 clone *[Siberian C (P. persica x P. amygdalus*, USA*)]*	Sensitive to drought conditions and other conditions that place roots under stress. Excellent in good soil and where good water management is applied.	Delays ripening of early cultivars by a few days. Rootstock is very sensitive to very low cold units, but serious symptoms similar to those seen in peaches have not yet been observed.
GF 667 clone *(Prunus persica x P. amygdalus*, France*)*	Very sensitive to wet conditions. Suitable in free-lime soils and in replant situations.	No symptoms in free-lime and brackish soils.
Flordaguard *(Prunus persica x P. davidiana*, USA*)*	Very sensitive to wet conditions. Suitable for well-drained soils.	Has a low chill requirement and is early bearing.
Viking clone *(P. persica x P. davidiana x P. dulcis x P. blireiana*, USA*)*	Apparent wide suitability. More tolerant to stress symptoms associated with wet conditions. Moderate resistant to free-lime and brack.	Also suitable for high pH soils but shows slight symptoms for replant situations. Productive and early bearing but sensitve to drying out before and at planting (overseas results).
Cadaman clone *(P. persica x P. davidiana*, Hungary and France*)*	Sensitive to wet conditions. Suitable for free-lime soils (overseas results).	Sensitive to drying out before and with planting (overseas results).
Atlas *(P. persica x P. davidiana x P. dulcis x P. blireiana*, USA*)*	Sensitive to wet conditions.	Sensitive to drying out before and with planting (overseas results).

CONCLUSIONS AND RECOMMENDATIONS FOR PLUMS

Kakamas seedling is not recommended for plums because the yield efficiency and fruit mass on this rootstock are poorer than on Marianna as rootstock. Kakamas seedling is however, in almost all cases, less vigorous than Marianna.

Maridon is recommended as a plum rootstock for shallow, somewhat heavier soil, and where wet conditions occur periodically, as well as under conditions that can favour bacterial canker. Only 'Pioneer' is poorly compatable with Maridon, and even with Marianna. With Maridon's true-to-type problems solved, this rootstock became the first choice of the Marianna types, followed by Marianna.

SAPO 778 clone performs well and is recommended above Kakamas seedling. This rootstock induces beter yield efficiency and fruit mass than Marianna as rootstock, although it it not always statistically better. The rootstock delays the ripening of early plum cultivars by several days. The rootstock has a high chill requirement that may cause yellowing of leaves in very warm areas. Rather plant Maridon if any wet conditions prevail.

Viking as rootstock appears to be suitable and performs well over a wide range of soil conditions. In the case of plums, this rootstock is not better or poorer than SAPO 778 in terms of fruit mass and yield efficiency. It performs very well on free lime soils but is not completely symptom free.

GF 667 is recommended for soils with free lime and high pH. The rootstock shows no leaf browning symptoms under moderate brack conditions. GF 677 is however very suceptible to nematodes and waterlogging conditions and incompatability has been observed with Sapphire scion.

Cadaman's rootstock yield efficiency does not differ from that of Marianna. This rootstock has however not always been evaluated on soils where it is possibly more suitable (free-lime soil), and medium potential soils.

Atlas as rootstock performs well for plums, especially with regard to fruit mass and yield efficiency. This rootstock compares well with SAPO 778 and GF 677. This rootstock is wet sensitive. It has also not been evaluated locally in free-lime soil.

Fig 3
Budding of a plum scion on a suitable rootstock

Fig 4
Shallow spreading Maridon roots

Fig 5
V-system as used for plums

Fig 6
Bud union thickening of Sapphire scion cultivar on SAPO 778 rootstock

Soil suitablility can be summarised as follows:

- Free-lime and mildly brackish soil: first priority is GF 677, followed by Viking. (Atlas and Cadaman was not tested under these conditions for plums in South Africa)
- Wet conditions: Maridon
- Heavier soils: Maridon or Marianna
- Shallower soils: Maridon or Marianna
- Deep, well-drained, poorer soils: Flordaguard
- Medium to high potential soils that are well drained: SAPO 778, Atlas and Viking
- Good, well aerated gravel soils: SAPO 778, Viking or Atlas
- Soils in which root-knot nematodes cause problems: Maridon, Marianna, Flordaguard, SAPO 778, Viking and Atlas, depending on other soil properties. As yet there is no rootstock resistant to ring nematode, which occurs widely (Storey, 2006).

Horticultural adaptability:

- Increased fruit mass: SAPO 778, Atlas, GF 677, Flordaguard
- Increased yield efficiency: Viking, GF 677, Atlas, SAPO 778
- Increased vigour compared to Marianna: Flordaguard, SAPO 778.

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For more information, contact Piet Stassen at ARC Infruitec-Nietvoorbij, Stellenbosch tel: 021 809 3380 of fax: 021 809 3400

Fig 7
Rootstock trial block with Sapphire as the scion cultivar

Fig 8
Plum trees that die-back due to bacterial canker. This is exacerbated by periodical wet conditions in the soil.