Selection of *Prunus spinosa* as a dwarfing rootstock for high density plum orchards

Frank Maas, Jacinta Balkhoven & Pieter van der Steeg
Aims of rootstock selection program

- Rootstock for plum giving a tree vigour weaker than St. Julien A
- Precocious yields of high-quality fruits
- Resistant rootstock (frost, *Pseudomonas, Sharka*)
- Good propagation and grafting properties
- Applicable for plum as well as for other stone fruit species (peach, nectarine, apricot)
Why *Prunus spinosa*?

- Genetic relationship and recorded graft compatibility with plum and apricot
- Positive experience when used as rootstock in previous trials

*NB.* At the start of the *Prunus spinosa* selection program Krymsk-1 (VVA-1) was still unknown.
1987 Fruit research station Wilheminadorp
1,000 seedlings (Bob Wertheim)

1990 Budding of ‘Opal’ on 583 P. spinosa seedlings

1991 Selection of the 113 best looking trees


2000 Move research station to Randwijk. Root balls of the best 17 trees were replanted in a hedgerow
Introduction and sales of plum trees on Krymsk-1 in the Netherlands

Commercial sales of trees on VVA-1 in NL

Plum production area NL: 250 ha

Total sales 2002-2008: 120,205 trees

Victoria 56%
Opal 20%
Jubileum 11%
new varieties 10%
Mgr Hatif 2%
Valo
Avalon
Anna Späth
Excalibur
Voyageur

Plum production area NL: 250 ha
Problems with Krymsk-1 in commercial orchards

Tree decline

Disease symptoms of bacterial *Pseudomonas* canker

Photo’s: Marcel Wenneker, PPO-Randwijk, NL
Continuation of selection and evaluation of *P. spinosa* as plum rootstocks in Randwijk

- Winter cuttings not successful (insufficient rooting)
- Summer cuttings more successful (better rooting)

**New rootstock evaluation trials (2005-2010)**
- 3 trials with ‘Victoria’ as scion cultivar on 15 *P. spinosa* selections
Selection criteria

- Tree vigour intermediate between that on St. Julien A and Krymsk-1
- Production efficiency
- Fruit quality (size, fruit cracks, gummosis)
- Root suckers
- Presence/abundance of thorns
Effect rootstocks on tree vigour and production efficiency

Trial with plum 'Victoria' planted in 2006
Results of trials at research station Randwijk
‘Victoria’ 6 years after planting

St. Julien A
S 766
Krymsk 1
November 2011, year 6
Development root suckers 2006-2011

Root suckers indexed on scale of 1 (no suckers) to 9 (very strong suckering)

M709 rejected: too many root suckers
P. spinosa
M709
Variability in spine development *P. spinosa*

many

moderate

few
Effect rootstock on yield and fruit weight ‘Victoria’
Effect rootstock on fruit gummosis

Harvest 2010

% fruits without gummosis

M783  M633  M107  M651  M652  St.Jul.A  Krymsk-1  S766  M709

- none
- severe
Effect rootstock on % cracked fruits

Trend towards lower % of cracked fruits with some *P. spinosa* selections (F-test: P=0.066)
## Summary performance *Prunus spinosa* rootstocks

<table>
<thead>
<tr>
<th>Rootstock</th>
<th>Growth reduction&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Production efficiency&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Fruit size&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Root suckers&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Spines&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z843</td>
<td>5%</td>
<td>+-</td>
<td>+</td>
<td>3-4</td>
<td>3-5</td>
</tr>
<tr>
<td>Z439</td>
<td>10%</td>
<td>-</td>
<td>+</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>M354</td>
<td>5-20%</td>
<td>+</td>
<td>+</td>
<td>6</td>
<td>3-5</td>
</tr>
<tr>
<td>S337</td>
<td>10-25%</td>
<td>+ / -</td>
<td>-</td>
<td>1-5</td>
<td>3-5</td>
</tr>
<tr>
<td>S747</td>
<td>15-20%</td>
<td>+</td>
<td>+</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>M651</td>
<td>20%</td>
<td>+(-)</td>
<td>+(-)</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>M783</td>
<td>20-25%</td>
<td>+(-)</td>
<td>+(-)</td>
<td>2</td>
<td>3-5</td>
</tr>
<tr>
<td>M107</td>
<td>25-30%</td>
<td>+</td>
<td>+</td>
<td>8</td>
<td>3-5</td>
</tr>
<tr>
<td>Z562</td>
<td>30%</td>
<td>+</td>
<td>+(-)</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>M633</td>
<td>25-35%</td>
<td>+(-)</td>
<td>+(-)</td>
<td>2-6</td>
<td>3</td>
</tr>
<tr>
<td>S766</td>
<td>35%</td>
<td>++</td>
<td>++</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>M852</td>
<td>35-40%</td>
<td>+</td>
<td>+(-)</td>
<td>3-5</td>
<td>8</td>
</tr>
<tr>
<td>Z428</td>
<td>15-50%</td>
<td>+</td>
<td>++</td>
<td>3-5</td>
<td>6</td>
</tr>
<tr>
<td>M709</td>
<td>45%</td>
<td>++</td>
<td>+</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Z801</td>
<td>60%</td>
<td>+</td>
<td>+</td>
<td>3</td>
<td>9</td>
</tr>
</tbody>
</table>

<sup>1</sup> relative to St. Julien A; <sup>2</sup> on scale of 1 (very few) to 9 (very many)
Graft compatibility *P. spinosa* and plum

- No problems observed with ‘Opal’ and ‘Victoria’
Graft unions ‘Victoria’ plum grafted on St. Julien A, Krymsk-1 and *P. spinosa* S766

Year of planting: 2008  Photo’s: 2012-11-27
Next steps towards market introduction

*P. spinosa* rootstock selection(s)

- VIRUS FREE plant material of the best selections
  - 2009: 7 selections sent to NAKTuinbouw
  - 2010: 5 selecties tested for virus diseases
  - 2011: 2 selections virus free
- Application for breeders’ rights for selection S-766
In vitro propagated plant material

Schrama Fruit Tree Nursery, Biddinghuizen, The Netherlands
Further actions

- 2013 Planting demonstration pilots ‘Victoria’ and Lazoet plums in commercial orchards in the Netherlands
- Founding of consortium of Dutch nurseries for propagation and production of selected *P. spinosa* rootstocks and fruit trees on *P. spinosa* rootstocks
- Issuance of *P. spinosa* rootstocks and fruit trees on *P. spinosa* for evaluation trials in other counties

INTERESTED? contact frank.maas@wur.nl
Thank you for your attention