Cherry Rootstock Trials in Slovenia

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COST FA1104-WG2/Trebinje, 10.-11. February, 2015
the most common cherry trees in Slovenia are on seedling (P. avium)
Why working on rootstocks?

• We can regulate tree vigour with a good choice of combination between rootstock and cherry variety

• We can choose the appropriate rootstock for certain soil type and production technology (less vigorous trees in intensive orchards with irrigation and rain protective systems, hail nets, nets against the birds,...)

• We usually obtain homogeneous tree vigour, yield precocity

• We want a rootstock that has a positive effect to the fruit size and not induced early senescence, tree mortality, appearance of suckers, sensitivity to the low temperatures and diseases (viruses, bacterioses, ...)
Intensive, high density orchards in Italy
Rain and hail protection system in the experimental cherry orchard in Bilje (Slovenia)
Slovenia as a part of ALPE ADRIA group carried out three rootstock trials

**MATERIAL**

- **TRIAL 1**: Bilje; 1997-2005
cv. Lapins/
Gisela 4, 5, 195/20, Weiroot 158, 72, 13, Tabel Edabriz, MaxMa 14,
Piku 4.20 (PiKu 1), F12/1

- **TRIAL 2**: Bilje, Maribor; 2006-2013
cv. Kordia and cv. Regina/
Gisela 6, Weiroot 158, PHL-C, Gisela 5, PiKu 1

- **TRIAL 3**: Bilje, Maribor; 2006-2013 - density trial
cv. Regina/
Gisela 3, Weiroot 72, Gisela 5/
Orchard distances/density (trees/ha): 4.0mx1.5 m; 1667
4.0mx2.0 m; 1250
4.0mx2.5 m; 1000
GAČNIK:
- Altitude: 292 m
- Average (1991-2006) T/year: 10.7 °C
- Solar radiation (h/year): 1902
- Precipitation (mm/year): 994
- Soil: heavy-loamy, subalcaline, medium mineral and poor organic content

BILJE:
- Altitude: 55 m
- Average (1991-2006) T/year: 12.6°C
- Solar radiation (h/year): 2189
- Precipitation (mm/year): 1423
- Soil: sandy with stone content, subacid, medium organic and mineral content
METHODS

- TCSA (cm\(^2\)) was calculated from trunk diameter: annually, 20 cm above the graft union
- Canopy volume: \(V = \frac{1}{3} \pi \frac{l}{4} \cdot \frac{d}{4} \cdot h\) was calculated from canopy dimensions height \((h)\), length \((l)\), width \((w)\)
- Yield/tree (kg): annually from 2008-2013
- Yield efficiency (kg cm\(^{-2}\)): was calculated from cumulative yield (2008-2013)/TCSA (2013)
- Fruit weight (g): from representative sampling of 100 fruits/tree
- Statistical analyses for the trial 1- program Statgraphics Plus, for the trial 2 and trial 3 R program (R Development Core Team) - ANOVA, differences were compared using Duncan’s and HSD multiple comparison tests
Rootstock effect on vigour (F12/1=100 %) - average of 6 ex. stations

Bilje-SLO
Verona, Sondrio, Laimburg - Italy
Haidegg - Austria
Veitshöchheim - Germany

F12/1 MaxMa 14 Weiroot 13 Weiroot 158 Gisela195/20 Piku 1 Gisela 4 T.Edabriz Gisela 5
Effect of rootstocks and locations on cumulative yield and fruit weight
CONCLUSIONS-TRIAL 1

Tree vigour
- The most vigorous trees: F12/1 > MaxMa 14 > Weiroot 13
- Middle vigour: PiKu 1, Gisela 195/20, Weiroot 13
- The weakest: W 72, G 5, G 4* and Tabel Edabriz
  *Gisela 4 - tree mortality rate after 5 years - 100 %

Average cumulative yield
max. on PiKu 1 (21 kg/tree) > W 13 > MaxMa 14 > G 195/20 > W 158 > G 5 > W 72 > F12/1 > min. on T Edabriz (9.4 kg/tree)

Yield efficiency
max. on G 5 (0.86) > TE > W 72 > PiKu1 > G 195/20 > W 13 > W158 > MaxMa 14 > min. on F12/1 (0.25)

Fruit weight
F 12/1 (8.4 g) > W 72 > G 195/20.............................> min. on PiKu 1 (7.6 g)
CONCLUSIONS

PiKU 1 = PiKU 4.20

best results,
reduced vigour 25% in comparison to F12/1 precocity, highest yield/tree, good fruit size, without suckers, without deficit of trees, suitable for bad locations and replacing
CONCLUSIONS

GiSelA 5
weak growth (in some locations is as strong as W 158), good branching, precocity, very good (big) fruitset (too big!?), fruit size just a little smaller than on F12/1, extremely high specific yield, high production/ha, in case of high flowerset – thinning the flowers! For good growing conditions and irrigation
TRIAL 2
Effect of rootstock and location on tree vigour (TCSA increment 2006-2012 in cm²)

average of Kordia and Regina

<table>
<thead>
<tr>
<th>Rootstock</th>
<th>Bilje</th>
<th>Gačnik</th>
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<tbody>
<tr>
<td>Gisela 5</td>
<td>32.8</td>
<td>87.46</td>
</tr>
<tr>
<td>Gisela 6</td>
<td>76.36</td>
<td>122.62</td>
</tr>
<tr>
<td>PHL-C</td>
<td>52</td>
<td>127.69</td>
</tr>
<tr>
<td>Piku 1</td>
<td>48.325</td>
<td>94.985</td>
</tr>
<tr>
<td>W 158</td>
<td>64.975</td>
<td>93.075</td>
</tr>
</tbody>
</table>
Effect of rootstock and location on cumulative yield (kg) of sweet cherry *cv. Kordia* (2008-2012)

Source: V. Usenik et al., 2013
Effect of rootstock and location on cumulative yield (kg) of sweet cherry cv. Regina (2008-2012)

Source: V. Usenik et al., 2013
Effect of rootstock, location and year on average fruit weight (g) of sweet cherry Kordia (fig. up) (2008 - 2012) and Regina (fig. down)

Source: V. Usenik et al., 2013
CONCLUSIONS - TRIAL 2

Tree vigour
- Trees on all rootstocks were significantly more vigorous in Maribor than in Bilje (G 6 = PHLC > G5 > PiKu 1 > W 158)

Average yield/tree
- Trees on Gisela 6 were the most and on PHL-C the least productive
  Rootstocks influenced the average yield/tree as follows:
  Gisela 6 > Piku 1 ≥ Gisela 5 ≥ Weiroot 158 > PHL-C
- Kordia - there were no significant differences between locations
- Regina - significantly higher yield in Maribor

Yield efficiency – Ye (kg·cm⁻²)
- was significantly affected by location and cultivar/rootstock interaction (Bilje > Gačnik)
- Kordia - no significant effect of rootstock
- Regina - on Gisela 5 was the highest and similar to trees on Gisela 6 and Piku 1 and significantly higher compared to PHL-C and Weiroot 158.
TRIAL 3
Effect of rootstock, location and plant distance on TCSA (cm$^2$) of sweet cherry cv. Regina in 2013
Effect of location on cumulative yield (kg/tree) of Regina on Gisela 3, Gisela 5 and Weiroot 72
CONCLUSIONS-TRIAL 3

• **TCSA**
The most vigorous trees were in Maribor on all rootstocks and tree distances.

• **Cumulative yield**
  Was the highest on Gisela 5 at t.d. 2.0 m in Maribor (34 kg/tree) and the lowest on Gisela 3 at t.d. 1.5 m in Bilje (9 kg/tree). Maribor had better results with Gisela 3 and Gisela 5, Bilje with Weiroot 72.

• **Yield efficiency**
The highest on Gisela 3 and the lowest on Weiroot 72.

• **Fruit weight**
The biggest fruit size on Gisela 5 at t.d. 2.5 m in Maribor (10.3 g/fruit).

• **Tree mortality**
  On Gisela 3 at t.d. 1.5 m in Maribor (40%) after 8 year period.
Thank you for your attention

Regina/W 72
Bilje-Slovenia, at 7th leaf