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Production Systems

Studies on some cherry clonal rootstocks in nursery

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Abstract. The vegetative manifestations of three cherry clonal rootstocks Merisier F12.1, Saint Lucie GF 64 and Gi-Sel-A5, grafted with the variety Summit, were studied in nursery. Merisier F12.1 and especially Gi-Sel-A5 have earlier attenuation in the pace of the rootstocks thickening in the nursery during the I\textsuperscript{st} year. Under the influence of slowly growing Gi-Sel-A5 the graft has a lower rate of weight gain and increase in height. Summit/Saint Lucie GF 64 has the greatest length of annual growth.

Keywords: cherry, rootstocks, Merisier F12.1, Saint Lucie GF 64, Gi-Sel-A5

Introduction

Cherry production has a great economic importance and prospects for further development in Bulgaria. Currently, the creation of intense cherry trees is of need in order to increase yields and reduce costs of production. One of the factors for the intensification is the introduction of weak clonal rootstocks in cherry production. In countries with developed fruitgrowing most used pads are cherry seed and clonal forms of Prunus avium. Future cherry growing depends on the introduction of rootstocks with moderate and weak growth (Ebrahim et al., 2003; Bargioni et al., 1986). Thus, an increase of the planting density and reduction of cherry fruit production costs can be achieved (Callesen and Vittrup, 1996; Ystaas and Froynes, 1996).

Nowadays, with the prevalence of intensive fruitgrowing, the attention of researchers is drawn entirely from the undeniable merits of clonal cherry rootstocks. Drabudko (2009), by applying the conditions in Belarus, follows the development of some of them (MIP-2, W2-180, PN, VSL-2, AVCh-2, Damil(GM-61/1)) in nursery and finds that they all exhibit lower volume growth of Prunus avium.

Based on their experiments in nursery with pads SL64, MxM14 MxM97, Hrotko and Fuzessery (1996) recommend SL64 as the most suitable for the grafted varieties. According to them, MxM14 and MxM97 show the greatest development intensity in nursery during the I-st year, but they do not induce it to the transplanted varieties in nursery during the II-nd year. In other studies Hrotko et al. (1997), by tracing cherry rootstocks SL64, Mazzard C2493, Cold, MxM14 MxM97 in nursery, found that the most effective growth of the grafted varieties is induced by SL64. Tree dimension with Cold were 15–20% smaller, and 40–50% smaller with MxM14 MxM97, respectively. According to the authors, Mazzard S2493 showed growing force similar to that of Cold.

Other authors (Samus and Drabudko, 2009) investigated the cherry rootstocks Mazzard, Izmaylovskiy, VSL-2, Damil GM-61/1, AVCh-2, V-5-88 and found that all of them except for Mazzard have well-aligned vegetative development in nursery during the I-st year. Moreno et al. (2002) investigated the Sanbarst variety for rootstocks CAB 6P, CAB 11F, Colt, GM 9 (lumil), GM 61/1 (lamil), Mastro de Montanana an 9 (MM 9) MahMa 14 MahMa 97 and Saint Lucie GF 64 (SL 64) in nursery. According to the authors, the weakest growth is observed with the rootstock Damil. To some extent, stronger growth is observed with Colt, MM 9 and CAB 6P. The difference in the strength of growth in CAB 11E and Saint Lucie GF 64 is practically negligible.

Researchers have also demonstrated significant interest in the German cherry clonal rootstock selections. Bijdoso and Hrotko (2006) studied Gi-Sel-A 5 and 6 in Hungarian conditions and compared them with the traditional local Prunus Mahaleb variety selection “Cema”. The grafts are thinner and show smaller stem growth when grafted on the new German rootstocks in comparison with Prunus Mahaleb. A smaller number of feathers are also observed with the German rootstocks in nursery, as well. Attention is drawn not only on the growth characteristics of the rootstock and the strength transmitted to the graft, but also in terms of the quality of the propagation material defined by the feathers in nursery (Wustenberghs et al., 1996). The aim of researchers for several decades has been to identify the most appropriate version of rootstocks for different site conditions and different varieties in order to fully promote intensification in cherry production.

The goal we set for ourselves in the present study was to investigate the vegetative habits of some cherry clonal rootstocks in nursery I-st year and their impact on the development of the grafted variety Summit in nursery II-nd year in the conditions of the region of Plovdiv.

Material and methods

The study was conducted in the region of Plovdiv in the period 2008 – 2010. The experiment included three in vitro produced cherry clonal rootstocks – Merisier F12.1, Saint Lucie GF 64 and Gi-Sel-A5, which are planted in nursery I-st year with a distance of 160/20 cm. Moreover, they were grafted with the Summit variety.

The following rootstock indicators were tracked in the nursery I-st year: thickness at 12-15 cm above the soil surface, mm; dynamics of thickening, mm; height, cm; dynamics of growth, cm; average length
of feathers, cm.

The following indicators were tracked in nursery IInd year: thickness of the rootstock pads underneath, mm; dynamics of the graft thickening, mm; graft height, cm; growth dynamics of the graft, cm; average number of feathers, number; average length of the feathers, cm.

The results were collected based on 40 plants of each variation, located in 4 repetitions of 10 plants each, and processed by the method of statistical analysis of variance.

**Results and discussion**

At the beginning of vegetation, the rate of thickening of the rootstocks is nearly uniform (Figure 1). Later Gi-Sel-A 5 shows rapid growth rate in comparison with the others. However, in Merisier F12.1 and Gi-Sel-A 5, an earlier completion of thickening is observed compared to Saint Lucie GF 64 which thickening continues to accelerate at the end of the vegetation period. Its thickness shows higher values than those of Gi-Sel-A 5, indicating its thickness superiority, albeit marginally, in the beginning. However, in terms of thickness, the three rootstocks do not show statistically significant differences at the end of the vegetation period (Table 1).

In respect to the rootstocks growth dynamics, approximately the same pattern was observed (Figure 2). At the beginning of the vegetation period the three rootstocks increased by almost the same rate, then Gi-Sel-A 5 slightly outperformed the other two substrates. In the middle of the period the growth rate in Saint Lucie GF 64 significantly increased, followed by Merisier F12.1. The growth in Gi-Sel-A 5 gradually began to decline. At the end of the period, the lowest growth rate was in Gi-Sel-A 5, followed by Merisier F12.1 and Saint Lucie GF 64. At the end of the vegetation period, the lowest plants were Gi-Sel-A 5, and the highest – Merisier F12.1. Saint Lucie GF 64 occupied an intermediate position (Table 1). The lowest average length of feathers at the end of the vegetation period is present in Saint Lucie GF 64, followed by the other two rootstocks and the reported differences are not significant.

In nursery IInd year measured in early July (Figure 3), the thickest graft is observed with Meisier F12.1 and the thinnest one with Saint Lucie GF64. The rate of thickening of the graft is almost the same until the end of the month in all three options with a slight overperformance in Merisier F12.1. Until mid-August the graft with Gi-Sel-A 5 remains the weakest followed by that of Saint Lucie GF 64 and, once again, the best performance is with Merisier F12.1. From mid-August till 25. September thickening gradually decreases in first Gi-Sel-A and 5 Merisier F12.1 and finally with Daint Lucie GF 64. Eventually, the greatest thickness of the graft is observed with rootstock Merisier F12.1, followed by Saint Lucie GF 64 and Gi-Sel-A 5 and the differences are statistically significant (Table 2).

From Table 2 it is clear that the smallest thickness of the plants occurred with rootstock Gi-Sel-A 5, followed by the other two in nursery IInd year at the end of the vegetation period. Differences between Gi-Sel-A and 5 Merisier F12.1 are statistically significant. Saint Lucie GF 64 occupies an intermediate position. Figure 4 graphically represents the correlation between the rootstock and the graft in terms of thickness. In the present case the rootstocks with

![Figure 1](image1.png)  
*Figure 1. Dynamics of rootstock’s thickening in nursery I**nd** year*

![Figure 2](image2.png)  
*Figure 2. Dynamics of growth of rootstock in nursery I**nd** year*

<table>
<thead>
<tr>
<th>Variants</th>
<th>Thickness, mm</th>
<th>Height, cm</th>
<th>Average length of feather twigs, cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merisier F12.1</td>
<td>11.99</td>
<td>127.40</td>
<td>45.42</td>
</tr>
<tr>
<td>Saint Lucie GF 64</td>
<td>11.53</td>
<td>126.60</td>
<td>34.74</td>
</tr>
<tr>
<td>Gi-Sel-A 5</td>
<td>11.14</td>
<td>96.60</td>
<td>48.51</td>
</tr>
<tr>
<td>GD at 5 %</td>
<td>2.19</td>
<td>32.83</td>
<td>20.74</td>
</tr>
<tr>
<td>1 %</td>
<td>5.32</td>
<td>79.94</td>
<td>31.42</td>
</tr>
<tr>
<td>0.1 %</td>
<td>3.31</td>
<td>49.73</td>
<td>50.51</td>
</tr>
</tbody>
</table>

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**Table 1. Growth features of the rootstocks in nursery I**nd** year**
grow at a much faster pace together with a solid graft thickening in this period. Meanwhile, the growth rate of the graft with Gi-Sel-A 5 is the weakest. This trend continues in the last stage of the follow-up period and eventually Gi-Sel-A 5 has the lowest thickness results. Summit / Saint Lucie GF 64 occupies an intermediate position during the entire growing season. The highest graft is observed with rootstock Summit / Merisier F12.1, and the lowest one - with Gi-Sel-A 5, as reported differences are statistically significant (Table 3).

Figure 3. Dynamics of thickening of grafted part in nursery II nd year

Figure 4. Thickness of rootstock and grafted part in nursery II nd year

Table 2. Thickness of rootstocks in nursery II nd year

<table>
<thead>
<tr>
<th>Variants</th>
<th>Thickness, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merisier F12.1</td>
<td>23.05</td>
</tr>
<tr>
<td>Saint Lucie GF 64</td>
<td>19.64</td>
</tr>
<tr>
<td>Gi-Sel-A 5</td>
<td>17.99</td>
</tr>
<tr>
<td>GD at 5 %</td>
<td>4.44</td>
</tr>
<tr>
<td>1 %</td>
<td>6.73</td>
</tr>
<tr>
<td>0.1 %</td>
<td>10.82</td>
</tr>
</tbody>
</table>

Figure 5. Dynamics of growth of grafted part
greater thickness ensure respectively greater thickness in the development of the graft at the end of the vegetation period.

In respect to the growth dynamics of the graft (Figure 5), it should be noted that Merisier F12.1 shows the worst initial performance, while the other two rootstocks increase with almost the same speed, despite the opposite trend in thickness. Over the next month, however, the graft with rootstock Merisier F12.1 continues to grow at a much faster pace together with a solid graft thickening in this period. Meanwhile, the growth rate of the graft with Gi-Sel-A 5 is the weakest. This trend continues in the last stage of the follow-up period and eventually Gi-Sel-A 5 has the lowest thickness results. Summit / Saint Lucie GF 64 occupies an intermediate position during the entire growing season. The highest graft is observed with rootstock Summit / Merisier F12.1, and the lowest one - with Gi-Sel-A 5, as reported differences are statistically significant (Table 3).

Feathering has a significant influence on seed quality. The variety with Saint Lucie GF 64 has proven and longest feathers, followed by Gi-Sel-A 5 and Merisier F12.1. Trees with rootstock Saint Lucie GF 64 have the greatest overground vegetation mass due to the greater length of feathers and trees with rootstock Gi-Sel-A 5 have the least vegetation mass, respectively (Table 3).

Table 3. Growth features of the grafted part in nursery II nd year

<table>
<thead>
<tr>
<th>Variants</th>
<th>Thickness, mm</th>
<th>Height, cm</th>
<th>Average number of feather twigs</th>
<th>Average length of feather twigs, cm</th>
<th>Total length of feather twigs, cm</th>
<th>Total length, cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merisier F12.1</td>
<td>15.85</td>
<td>193.94</td>
<td>2.55</td>
<td>16.94</td>
<td>43.20</td>
<td>237.14</td>
</tr>
<tr>
<td>Saint Lucie GF 64</td>
<td>11.89</td>
<td>188.60</td>
<td>3.53</td>
<td>31.83</td>
<td>112.36</td>
<td>300.96</td>
</tr>
<tr>
<td>Gi-Sel-A 5</td>
<td>11.28</td>
<td>169.93</td>
<td>2.83</td>
<td>18.57</td>
<td>52.55</td>
<td>222.48</td>
</tr>
<tr>
<td>GD at 5 %</td>
<td>3.42</td>
<td>9.93</td>
<td>0.48</td>
<td>4.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 %</td>
<td>5.18</td>
<td>15.04</td>
<td>0.73</td>
<td>6.49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.1 %</td>
<td>8.33</td>
<td>24.18</td>
<td>1.17</td>
<td>10.44</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Conclusions

In Merisier F12.1 and especially Gi-Sel-A 5 there is an early decline in the rate of rootstock thickening in nursery I" year. This is indicative for an earlier reduction in the cambial activity and requires an earlier grafting of these two rootstocks in comparison with Saint Lucie GF 64, whose rate of both weight gain and increase in height, is greater until the late stages of the vegetation period.

In nursery II" year, the graft demonstrates a slower thickening rate and increase in height due to the influence of slowly growing Gi-Sel-A 5. Trees with rootstock Gi-Sel-A 5 have smaller thickness in comparison with the other two alternatives.

The length of the annual growth of the graft depends on the growth characteristics of the rootstock combinations, but there is already well-established specificity of the rootstock Saint Lucie GF 64 to form more feathers (Bujdoso and Hrotko, 2006). Therefore, Summit / Saint Lucie GF 64 has the greatest length of annual growth. This shows that the size of trees in nursery should not be seen as the only indicator for measuring their growth potential that can be otherwise demonstrated in real conditions.

References

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**The title** needs to be as concise and informative about the nature of research. It should be written with small letter /bold, 14/ without any abbreviations.

**Names and affiliation of authors**

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