Research concerning the establishment of plum cultivation technology in a superintensive system

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Abstract In order to modernise plum plantations and to increase economic efficiency, the super intensive cultivation system in this species should benefit from proper solutions to apply in agricultural practice. Plantation distances allowing the maximum limit in the super intensive system (5 x 2 m) ensure higher fruit tree growth vigour from the point of view of trunk section and canopy diameter, together with higher cultivar yield. To note, among studied canopy shapes, the Pillar shape, in which studied cultivars yield the most. Studied cultivars behave well in the area; the Stanley cultivar is to be noted in conditions of super-intensification.

Plum is the fruit tree species with the highest adaptability in the cultivation areas, ranking first in all the statistics concerning occupied cultivation areas, but the study concerning the modernisation of the cultivation technology of this species is rather rare.

This has been the focus of the research team at the Fruit Tree Research and Production Station in Caransebeş (Caras-Severin County) aiming at obtaining small fruit tree size, quick fructification right one year after plantation, increasing fruit tree density to 600-1000 trees/ha, obtaining yields of 20 t/ha in the first fructification years (4-5 years after plantation), and studying the newly-developed cultivars from the point of view of this technology.

Material and Method

In order to establish plum cultivation technology in a super-intensive system, we organised a poly-factorial experiment with the following factors:
- planting distance:
  - 5x1m
  - 5x2m
- Canopy shape
  - Pillar
  - Ypsilon (perpendicular on the tree row)
- studied cultivars
  - Stanley
  - Alina
  - Sarmatic
  - Centenar

Each variant had a number of 3 replications with 5 trees per replication, i.e. 15 trees, with 120 trees per experiment and 62 trees in isolation.

The year 1988 was the year the trees were planted.

The experiment was set on a soil specific to the area, while the cultivation technology from the point of view of soil maintenance and treatments were the traditional ones. Cuttings were done in a sustained, specialised way after the double sectional method and in the first 2 years after plantation we applied 2 treatments with the product Allar 85 at rates of 2000 ppm.

We made observations and measurements concerning tree vigour and desired fruit yield.

Results and Discussions

Data presented in Table 1 shows that in the super-intensive system the plantation distance of 5x2 m yielded resulted in distinctly differences 8.4 cm² higher than in the case of the plantation distance of 5x1 m, from the point of view of the trunk section area. Canopy shape did not significantly influence trunk section. The Alina cultivar has a trunk section 4.4 cm² higher than that of the Stanley cultivar, i.e. distinctly significant. The Sarmatic and Centenar cultivars have a 10.3-12.3 cm² trunk section area smaller than that of the Stanley cultivar, i.e. very significant.
Table 1

Isolated action of planting distance, canopy shape, and cultivar on the trunk section area (cm²) in the super intensive plum orchard at SCPP Caransebeș (Caras-Severin County)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Average</th>
<th>Percentage points</th>
<th>Difference ±</th>
<th>Significance</th>
<th>DL</th>
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<tbody>
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<td></td>
<td>5%</td>
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<td></td>
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<td>0.1%</td>
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<tr>
<td>SUPERINTENSIV</td>
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<tr>
<td>Planting distance</td>
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</tr>
<tr>
<td>5x1</td>
<td>41.6</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>3.07</td>
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<tr>
<td>5x2</td>
<td>50.0</td>
<td>120</td>
<td>8.4</td>
<td>**</td>
<td>4.79</td>
</tr>
<tr>
<td>5x2</td>
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<td></td>
<td></td>
<td></td>
<td>15.25</td>
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<tr>
<td>Pillar</td>
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<td>100</td>
<td>-</td>
<td>-</td>
<td>3.01</td>
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<tr>
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<td>4.98</td>
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<td>50.4</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>3.20</td>
</tr>
<tr>
<td>Alina</td>
<td>54.8</td>
<td>109</td>
<td>4.4</td>
<td>**</td>
<td>4.35</td>
</tr>
<tr>
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<td>40.3</td>
<td>80</td>
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<td>5.83</td>
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<tr>
<td>Centenar</td>
<td>38.1</td>
<td>76</td>
<td>-12.3</td>
<td>ooo</td>
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</table>

In the super-intensive cultivation system, canopy volume (Table 2) is larger when trees are cultivated at 5x2 m distance than when cultivated at 5x1 m, i.e. 0.79 m³, i.e. distinctly significant. The Ypsilon canopy shape has a volume 0.22 m³ larger, i.e. significant. The Sarmatic and Centenar cultivars have the smallest canopy volume.

Table 2

Isolated action of planting distance, canopy shape, and cultivar on the canopy volume (cm³) in the super intensive plum orchard at SCPP Caransebeș (Caras-Severin County)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Average</th>
<th>Percentage points</th>
<th>Difference ±</th>
<th>Significance</th>
<th>DL</th>
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<td></td>
<td>5%</td>
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<td></td>
<td></td>
<td></td>
<td>1%</td>
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<td></td>
<td></td>
<td>0.1%</td>
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<tr>
<td>SUPERINTENSIV</td>
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<tr>
<td>Planting distance</td>
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</tr>
<tr>
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<td>100</td>
<td>-</td>
<td>-</td>
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<tr>
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<td>109</td>
<td>0.22</td>
<td>*</td>
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<tr>
<td>Stanley</td>
<td>3.29</td>
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<td>-</td>
<td>0.20</td>
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<tr>
<td>Alina</td>
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<td>95</td>
<td>-0.15</td>
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<td>68</td>
<td>-1.06</td>
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<td>Centenar</td>
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<td>62</td>
<td>-1.25</td>
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</tbody>
</table>

Higher fruit production (27.3 t/ha) (Table 3) was ensured by smaller planting distances, while a yield of 16.7 t/ha recorded when planting at 5x2 m distance is significantly ensured as minus. At larger planting distances, the Pillar canopy shape yields more, with an average for the 3rd and 4th years after plantation of 23.2 t/ha; the yield of the Ypsilon canopy shape was 20.7 t/ha, statistically ensured as significantly negative.

The studied cultivars resulted in average yields of 31.0 t/ha (in the Stanley cultivar), 20.4 t/ha (Alina), 23.6 t/ha (Sarmatic), 12.9 t/ha (Centenar), yields 10.6 t/ha, 7.4 t/ha, 18.1 t/ha smaller, all of which are very significantly minus compared to the Stanley cultivar, while economic efficiency is according: the Stanley cultivar reaches a profitability rate of 191.0%, Alina 115.0%, Sarmatic 140.0%, and Centenar 49.0%.
Table 3.

Fruit yield (t/ha) and economic efficiency in the 3rd and 4th years after plantation in the super intensive plum orchard at SCPP Caransebeş (Caras-Severin County)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Age/year</th>
<th></th>
<th>Average 1983-1985</th>
<th>Percentage</th>
<th>Difference</th>
<th>Significance</th>
<th>Profitability rate %</th>
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<td>Planting distance</td>
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<tr>
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<td>18.6</td>
<td>34.8</td>
<td>27.3</td>
<td>100</td>
<td>-</td>
<td>-</td>
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<tr>
<td>5x2</td>
<td>2.5</td>
<td>8.6</td>
<td>24.8</td>
<td>16.7</td>
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<td>-10.6</td>
<td>o</td>
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<tr>
<td>DL 5% =</td>
<td>6.47</td>
<td>DL 1% =</td>
<td>14.95</td>
<td>DL 0.01% = 47.58</td>
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</tr>
<tr>
<td>Pillar</td>
<td>4.1</td>
<td>14.9</td>
<td>30.5</td>
<td>23.2</td>
<td>100</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ypsilon</td>
<td>2.2</td>
<td>12.3</td>
<td>29.1</td>
<td>20.7</td>
<td>89</td>
<td>-2.5</td>
<td>o</td>
</tr>
<tr>
<td>DL 5% =</td>
<td>2.37</td>
<td>DL 1% =</td>
<td>3.92</td>
<td>DL 0.01% = 7.33</td>
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<tr>
<td>Stanley</td>
<td>7.8</td>
<td>21.0</td>
<td>41.5</td>
<td>31.0</td>
<td>100</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Alina</td>
<td>1.1</td>
<td>13.1</td>
<td>27.8</td>
<td>20.4</td>
<td>66</td>
<td>-10.6</td>
<td>ooo</td>
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<tr>
<td>Sarmatic</td>
<td>1.7</td>
<td>14.5</td>
<td>32.8</td>
<td>23.6</td>
<td>76</td>
<td>-7.4</td>
<td>ooo</td>
</tr>
<tr>
<td>Centenar</td>
<td>1.9</td>
<td>5.9</td>
<td>17.3</td>
<td>12.9</td>
<td>42</td>
<td>-18.1</td>
<td>ooo</td>
</tr>
<tr>
<td>DL 5% =</td>
<td>3.24</td>
<td>DL 1% =</td>
<td>4.41</td>
<td>DL 0.01% = 5.90</td>
<td></td>
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</tbody>
</table>

The studied cultivars resulted in average yields of 31.0 t/ha (in the Stanley cultivar), 20.4 t/ha (Alina), 23.6 t/ha (Sarmatic), 12.9 t/ha (Centenar), yields 10.6 t/ha, 7.4 t/ha, 18.1 t/ha smaller, all of which are very significantly minus compared to the Stanley cultivar, while economic efficiency is according: the Stanley cultivar reaches a profitability rate of 191.0%, Alina 115.0%, Sarmatic 140.0%, and Centenar 49.0%.

Conclusions

1. The super-intensive planting system ensures the trees higher growth vigour both in trunk section area and in canopy volume, which is statistically ensured.
2. Larger canopy shape ensures higher canopy volume, which is also ensured statistically.
3. Lower growth vigour was recorded in the Sarmatic and Centenar cultivars.
4. Among the cultivars we studied, Stanley followed by Sarmatic, Alina and Centenar are most precocious and productive.
5. From an economic point of view, the Stanley cultivar can be noticed with yields covering 191% planting expenses followed by the Sarmatic, Alina and Centenar cultivars.

References