Research concerning the effect of green works and operations on yield in the Burgund mare grape variety cultivated at the Didactic Station in Timisoara, Romania

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Abstract The history of cultivating grape in Romania ever since times immemorial made Romanian historian and writer Bogdan Petriceicu Haşdeu say, over a century ago that “The Romanians have never stopped being a grape cultivators and wine makers”.

The national viticultural heritage covers all the grapevine plantations in Romania (fructifying vineyards grafted and planted, direct producing hybrids, viticultural nurseries, lands being prepared for cultivation, winemaking centres, and wine cellars.

Unfortunately, the economic and financial difficulties have caused the short progress of viticulture right after 1990 to be stopped; therefore, at present, land areas cultivated with grape are declining.

Viticulture is an important source of raw material for the production of wines, wine distilled drinks, and for the food industry, that produces grape juices, concentrated grape must, grape jams, grape preserves, raisins, etc.

In this paper, we present how grape growth and fructification processes can be regulated through works and operations in green on plants during vegetation.

Research aimed at presenting the effect of these works and operations in green on yield in the grape variety Burgund mare, a wine grape variety that responds well to such works.

The variants with the best results compared to the control variant were V₁₁, in which we applied a complex of operations in green (weeding, cutting young grape shoots, cutting stem tips), followed by the variant V₁₆ (weeding, cutting secondary grape shoots, cutting young grape shoots, cutting stem tips), and the variant V₁₅ (weeding, cutting secondary shoots, cutting young grape shoots).

The grape variety we studied – Burgund mare – at the Didactic Station in Timisoara, Romania, is a wine grape variety with a mean vegetation period (165-175 days); therefore, maturation of the stem xylem is better, which results in better resistance to the frost. It is a medium vigour grape variety, with moderate vegetative growths and high fertility (70-75% fertile shoots).

Bud differentiation is done starting with the base of the stems, a method that fits the most varied forms of guidance and cutting.

In this paper, we present the effect of cuts in green in the 16 trial variants in the years 2011-2012 on the quantitative level of the yield.

During the vegetation period, grapevine needs to be cut in dry and in green. Works and operations “in green” are done to regulate research and fructification processes and they complete fructification cuts in dry. Works and operations in green influence mainly the quality aspect of the yield, which makes them be used on a wider scale. Numerous researchers have studied the effects of the cuts in dry and in green on table and wine grape varieties (1, 2, 3, and 4).

Materials and Methods

We studied, in the soil and climate conditions of the Didactic Station in Timisoara, Romania, the effect of a combination of operations in green – weeding, cutting young grape shoots, cutting stem tips – on the wine grape variety Burgund mare in the years 2011-2012 in an 18-year old vineyard.

The trial was conducted on the wine grape variety Burgund mare that requires, in general, fewer operations in green.

The trial variants we studied were as follows:
- CONTROL
- V₁ – cutting young shoots (cys)
- V₂ – cutting secondary shoots (css)
V 3 – cutting secondary shoots and cutting young shoots (css + cys)
V 4 – cutting stem tips (cst)
V 5 – cutting stem tips and cutting young shoots (cst + cys)
V 6 – cutting stem tips and cutting secondary shoots (cst + css)
V 7 – cutting stem tips, cutting secondary shoots and cutting young shoots (cst + css + cys)
V 8 – removing shoots (rs)
V 9 – removing shoots and cutting young shoots (rs + cys)
V 10 – removing shoots and cutting secondary shoots (rs + css)
V 11 – removing shoots, cutting secondary shoots and cutting young shoots (rs + css + cys)
V 12 – removing shoots and cutting stem tips (rs + cst)
V 13 – removing shoots, cutting stem tips and cutting young shoots (rs + cst + cys)
V 14 – removing shoots, cutting stem tips and cutting secondary shoots (rs + cst + css)
V 15 – removing shoots, cutting stem tips, cutting secondary shoots and cutting young shoots (rs + cst + css + cys)

Results

Operations in green in viticulture can be grouped depending in their frequency as follows: current works and operations in green, rare works and operations in green, and table grape variety specific works and operations in green.

Table 1

Significance of differences between trial variants from the point of view of grape yield in 2011 in the grape variety Burgund mare

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Variant</th>
<th>Grape yield (kg/plant)</th>
<th>Compared to the trial mean</th>
<th>Significance of the difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>3.51</td>
<td>100,00</td>
<td>Control</td>
</tr>
<tr>
<td>2</td>
<td>V 1</td>
<td>2.91</td>
<td>82.90</td>
<td>-0.06</td>
</tr>
<tr>
<td>3</td>
<td>V 2</td>
<td>2.70</td>
<td>76.92</td>
<td>-0.81</td>
</tr>
<tr>
<td>4</td>
<td>V 3</td>
<td>2.77</td>
<td>78.91</td>
<td>-0.74</td>
</tr>
<tr>
<td>5</td>
<td>V 4</td>
<td>3.39</td>
<td>96.72</td>
<td>-0.115</td>
</tr>
<tr>
<td>6</td>
<td>V 5</td>
<td>3.87</td>
<td>110.39</td>
<td>0.36**</td>
</tr>
<tr>
<td>7</td>
<td>V 6</td>
<td>3.28</td>
<td>93.44</td>
<td>-0.23</td>
</tr>
<tr>
<td>8</td>
<td>V 7</td>
<td>3.99</td>
<td>113.67</td>
<td>0.48***</td>
</tr>
<tr>
<td>9</td>
<td>V 8</td>
<td>2.87</td>
<td>81.90</td>
<td>-0.63</td>
</tr>
<tr>
<td>10</td>
<td>V 9</td>
<td>2.76</td>
<td>78.63</td>
<td>-0.75</td>
</tr>
<tr>
<td>11</td>
<td>V 10</td>
<td>2.93</td>
<td>83.47</td>
<td>-0.58</td>
</tr>
<tr>
<td>12</td>
<td>V 11</td>
<td>4.90</td>
<td>139.74</td>
<td>1.39***</td>
</tr>
<tr>
<td>13</td>
<td>V 12</td>
<td>3.84</td>
<td>109.54</td>
<td>0.33**</td>
</tr>
<tr>
<td>14</td>
<td>V 13</td>
<td>3.67</td>
<td>104.55</td>
<td>0.16</td>
</tr>
<tr>
<td>15</td>
<td>V 14</td>
<td>4.01</td>
<td>114.24</td>
<td>0.50***</td>
</tr>
<tr>
<td>16</td>
<td>V 15</td>
<td>4.53</td>
<td>129.20</td>
<td>1.02***</td>
</tr>
</tbody>
</table>

We studied all the current works in grapevine, weeding, attaching grape shoots and cutting stem tips ad, among rare works, cutting young shoots and cutting secondary grape shoots.

Yields and results are presented for the two trial years and they are interpreted from a scientific point of view.

Results in the two trial years are presented synthetically in Tables 1 and 2.
Significance of differences between trial variants from the point of view of grape yield in 2012 in the grape variety Burgund mare

<table>
<thead>
<tr>
<th>Nr. crt</th>
<th>Variant</th>
<th>Grape yield (kg/plant)</th>
<th>Compared to the trial mean</th>
<th>Significance of the difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Relative value (%)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Control</td>
<td>2.87</td>
<td>100.00</td>
<td>Control</td>
</tr>
<tr>
<td>2</td>
<td>V 1</td>
<td>2.34</td>
<td>81.53</td>
<td>-0.53</td>
</tr>
<tr>
<td>3</td>
<td>V 2</td>
<td>2.10</td>
<td>73.17</td>
<td>-0.77</td>
</tr>
<tr>
<td>4</td>
<td>V 3</td>
<td>2.60</td>
<td>90.76</td>
<td>-0.26</td>
</tr>
<tr>
<td>5</td>
<td>V 4</td>
<td>3.02</td>
<td>105.40</td>
<td>0.15</td>
</tr>
<tr>
<td>6</td>
<td>V 5</td>
<td>3.05</td>
<td>106.44</td>
<td>0.18</td>
</tr>
<tr>
<td>7</td>
<td>V 6</td>
<td>3.10</td>
<td>108.18</td>
<td>0.23</td>
</tr>
<tr>
<td>8</td>
<td>V 7</td>
<td>3.11</td>
<td>108.53</td>
<td>0.24</td>
</tr>
<tr>
<td>9</td>
<td>V 8</td>
<td>2.00</td>
<td>69.68</td>
<td>-0.87</td>
</tr>
<tr>
<td>10</td>
<td>V 9</td>
<td>2.12</td>
<td>73.86</td>
<td>-0.75</td>
</tr>
<tr>
<td>11</td>
<td>V 10</td>
<td>2.30</td>
<td>80.13</td>
<td>-0.57</td>
</tr>
<tr>
<td>12</td>
<td>V 11</td>
<td>4.02</td>
<td>140.06</td>
<td>1.15***</td>
</tr>
<tr>
<td>13</td>
<td>V 12</td>
<td>3.30</td>
<td>115.15</td>
<td>0.43**</td>
</tr>
<tr>
<td>14</td>
<td>V 13</td>
<td>3.20</td>
<td>111.49</td>
<td>0.33*</td>
</tr>
<tr>
<td>15</td>
<td>V 14</td>
<td>3.52</td>
<td>122.64</td>
<td>0.65***</td>
</tr>
<tr>
<td>16</td>
<td>V 15</td>
<td>3.60</td>
<td>125.60</td>
<td>0.73***</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DL-5%</th>
<th>DL-1%</th>
<th>DL-0.1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.29</td>
<td>0.41</td>
<td>0.57</td>
</tr>
</tbody>
</table>

Tables 1 and 2 show that the difference between the trial mean in 2011 was 3.51 kg/plant and in 2012 it was 2.87 kg/plant compared to the control. This difference was the result of the drought in 2012.

The variant V₁₁ ranks first (weeding, cutting young shoots, cutting secondary grape shoots), followed by the variant V₁₆ (weeding, cutting young shoots, cutting secondary grape shoots, cutting stem tips), and by the variant V₁₅ (weeding, cutting young shoots, cutting secondary grape shoots).

Analysing the limits of transgression probabilities shows that, of the four operations in green we studied, only three – weeding, cutting young shoots, cutting secondary grape shoots – have a significant effect on yield quantitatively.

Conclusions

We need to note that applying operations in green as a complex of works – weeding, cutting young shoots, cutting secondary grape shoots – is more effective than just conducting these operations separately.

In the herbaceous phase, we need to suppress useless shoots, cut growing tips in the main grape shoots around blooming and cut secondary shoots when they have 4-6 leaves. We also need to replicate weeding upon first fructification of the grape shoots and cutting secondary shoots upon the third fructification, when the upper section of the grape shoots must be laid horizontally o the third wire: this is how we get significant increases in yield per ha in the grape variety Burgund mare.

References