Effect of Production System on Vegetative Growth, Yield, and Fruit Composition of Syrah Grapevines Grown in the San Joaquin Valley

d by D. Trowbridge, R.K. Striegler, and G.T. Berg

ABSTRACT

Syrah is a red wine grape cultivar that has been planted for production of high quality wines in certain warm viticultural regions. The objectives of this experiment are to evaluate Syrah as a potential wine grape cultivar for the San Joaquin Valley and to determine the effect of mechanized production systems on growth, yield, and fruit composition of Syrah grapevines. Mechanized production systems used in the experiment are 1) vertical shoot positioning; 2) machine pruning; and 3) minimal pruning. Mean results from the 1995 and 1996 seasons are presented in this report. Production system had a significant effect on yield and components of yield. Minimal pruning and machine pruning produced higher yield than vertical shoot positioning. Cluster number was greatest for minimally pruned vines. In addition, minimal pruning had a significant impact on cluster architecture. Clusters on minimally pruned vines were smaller and less compact. Fruit composition was not significantly influenced by production system. Production system significantly altered vegetative growth. Minimal pruning displayed the highest number of shoots per vine. However, total vegetative growth, as indicated by mature nodes per vine, did not differ significantly between treatments. These preliminary results suggest that Syrah is a promising red wine grape cultivar for the San Joaquin Valley. Further research is needed to determine equilibrium vine responses to the production systems included in this study.

INTRODUCTION

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Table 1. Effect of Production System on Yield and Components of Syrah Grapevines. 1995/1996 Mean Data. California State University, Fresno Campus Vineyard.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield (lbs/vine)</th>
<th>Yield (t/ha)</th>
<th>Clusters/vine</th>
<th>Cluster weight (lbs)</th>
<th>Berry weight (g)</th>
<th>Berries/cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSP</td>
<td>31.9b</td>
<td>8.3b</td>
<td>108c</td>
<td>0.20a</td>
<td>1.2a</td>
<td>114a</td>
</tr>
<tr>
<td>Machine pruning</td>
<td>49.3a</td>
<td>12.8a</td>
<td>186b</td>
<td>0.28b</td>
<td>1.2a</td>
<td>108a</td>
</tr>
<tr>
<td>Minimal pruning</td>
<td>56.6a</td>
<td>14.1a</td>
<td>421a</td>
<td>0.13c</td>
<td>1.0b</td>
<td>60b</td>
</tr>
</tbody>
</table>

Means followed by the same letter do not differ significantly at the 0.05 level. NS = not significant. Means separated by Duncan's Multiple Range Test.

MATERIALS AND METHODS

This experiment is being conducted on the California State University, Fresno campus vineyard. Syrah (clone 7) was grafted to Teleki 5C rootstock. Row orientation is east to west and vineyard spacing is 7' x 12' (vine x row). The trellis system consists of a three-wire vertical system with wooden posts every 21 feet. Wires are located at 44", 54", and 70". Irrigation is supplied through a drip system.

Treatments for the experiment are as follows:
1) Vertical Shoot Positioning (VSP) - vines trained to bilateral cordon established on lowest wire; moveable catch wires with hooks at 12" and 24" above the cordon to train the shoots upward; vines are prepruned by machine with hand follow-up. The resulting pruning job is equivalent to hand pruning.
2) Machine pruning - bilateral cordon trained vines established on the middle wire; vines are machine pruned with limited hand follow up.
3) Minimal pruning - vinestrained to the top wire; no dormant season pruning is practiced; vines trimmed under the row at berry set to facilitate air movement and remove low hanging fruit which would be missed by the mechanical harvester.

Production systems were selected because they represent a progression in the level of mechanization, can be done utilizing commercially available equipment, and are being used in warm climate viticulture production areas for Syrah. A randomized complete block experimental design has been implemented. There are five blocks, and plots consist of five vines. Treatments were established during the 1995 and 1994 seasons.

Data collection includes the following: 1) Shoot count, 2) Cluster count, 3) Fruit composition (berry weight, percent soluble solids, titratable acidity, and pH), 4) Yield, 5) Pruning weight, and 6) Mature node count. Berry samples (100 berries) were collected the day before harvest for measurement of fruit composition. The percent soluble solids, pH, and titratable acidity of these samples were determined by standard procedures (9). At harvest, yield and yield components of five vine plots were determined. Mature nodes were counted and dormant season pruning weight measured in December of each season.

Data were compiled and analyzed by analysis of variance (6). Mean separation was done using Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

Production system had a significant effect on the vegetative growth and yield of Syrah grapevines during the 1995 and 1996 seasons. Minimal pruning produced the highest yield and number of clusters per vine (Table 1). In addition, minimal pruning had a significant impact on cluster architecture. Cluster weight and berries per cluster were reduced by minimal pruning. The change in cluster architecture has been reported to reduce incidence of Botrytis bunch rot and powdery mildew for minimal pruning (2).

Fruit composition was not significantly influenced by production system (Table 2). However, it should be noted that minimally-pruned vines were harvested approximately 17 days later than the other treatments in 1995 to achieve the same soluble solids. In 1996 all treatments were harvested on the same day. Juice pH and titratable acidity did not differ significantly.

Minimal pruning displayed the highest number of shoots per vine and nodes retained (Table 3). However, total vegetative growth, as indicated by mature nodes per vine, did not differ significantly between treatments.

AUTHORS' NOTE

This publication contains preliminary results from the first two years of a proposed three-year study. It has not undergone peer review. Additional research findings are to be presented in 1998.

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<th>Soluble solids (%)</th>
<th>Berry weight (lbs/vine)</th>
<th>Clusters/vine</th>
<th>Berry yield (tons/vine)</th>
<th>Percent Soluble Solids</th>
<th>Percent Titratable Acidity</th>
<th>pH</th>
<th>Titratable Acidity (g/100ml)</th>
<th>Retained Nodes/vine</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSP</td>
<td>66b</td>
<td>23.7</td>
<td>12.8</td>
<td>108c</td>
<td>31.9b</td>
<td>0.30a</td>
<td>1.2a</td>
<td>114a</td>
<td>0.51</td>
<td>---</td>
</tr>
<tr>
<td>Machine pruning</td>
<td>61b</td>
<td>22.3</td>
<td>12.4</td>
<td>106b</td>
<td>49.3a</td>
<td>0.38a</td>
<td>1.3a</td>
<td>108a</td>
<td>0.49</td>
<td>102b</td>
</tr>
<tr>
<td>Minimal pruning</td>
<td>56a</td>
<td>22.3</td>
<td>12.4</td>
<td>106b</td>
<td>49.3a</td>
<td>0.38a</td>
<td>1.3a</td>
<td>108a</td>
<td>0.49</td>
<td>102b</td>
</tr>
</tbody>
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Table 2. Effect of Production System on Fruit Composition of Syrah Grapevines. 1995/1996 Mean Data. California State University, Fresno Campus Vineyard.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Shoots/vine</th>
<th>Soluble solids (%)</th>
<th>Berry weight (lbs/vine)</th>
<th>Clusters/vine</th>
<th>Berry yield (tons/vine)</th>
<th>Percent Soluble Solids</th>
<th>Percent Titratable Acidity</th>
<th>pH</th>
<th>Titratable Acidity (g/100ml)</th>
<th>Retained Nodes/vine</th>
</tr>
</thead>
<tbody>
<tr>
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<td>66b</td>
<td>23.7</td>
<td>12.8</td>
<td>108c</td>
<td>31.9b</td>
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<td>1.2a</td>
<td>114a</td>
<td>0.51</td>
<td>---</td>
</tr>
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<td>Machine pruning</td>
<td>61b</td>
<td>22.3</td>
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<td>0.38a</td>
<td>1.3a</td>
<td>108a</td>
<td>0.49</td>
<td>102b</td>
</tr>
<tr>
<td>Minimal pruning</td>
<td>56a</td>
<td>22.3</td>
<td>12.4</td>
<td>106b</td>
<td>49.3a</td>
<td>0.38a</td>
<td>1.3a</td>
<td>108a</td>
<td>0.49</td>
<td>102b</td>
</tr>
</tbody>
</table>

Means did not differ significantly at the 0.05 level.

Table 3. Effect of Production System on Growth of Syrah Grapevines. 1995/1996 Mean Data. California State University, Fresno Campus vineyard.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Shoots/vine</th>
<th>Mature nodes/vine</th>
<th>Pruning wt (lbs/vine)</th>
<th>Nodes Retained/vine</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSP</td>
<td>66b</td>
<td>449</td>
<td>6.8</td>
<td>56c</td>
</tr>
<tr>
<td>Machine pruning</td>
<td>61b</td>
<td>455</td>
<td>5.4</td>
<td>160b</td>
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<tr>
<td>Minimal pruning</td>
<td>56a</td>
<td>472</td>
<td>---</td>
<td>472a</td>
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