WATER MANAGEMENT STUDIES IN FOUR YOUNG LAKE COUNTY WALNUT ORCHARDS

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ABSTRACT

A study was set up to look at water management impacts on canopy development and yield in 4 adjacent Lake County orchards. All four orchards were Chandler on Paradox rootstock. The northwest and southwest orchard are planted at a spacing of 30’ x 30’. The northeast and southeast orchards are planted at a spacing of 28’ x 28’.

PROCEDURES

Midday stem water potential was measured on 14 trees in each of the four orchards approximately every week starting in late June and continuing through early October. On June 25, 2009, midday canopy light interception was measured in all four orchards using a mobile platform that measures photosynthetically active radiation continuously through the orchard. Seven rows were measured the mobile platform in each of the four orchards. At harvest time, the same rows were picked up and weighed on drive on scales that were placed under the truck trailers as they were being loaded. Subsamples were taken from each row and these were hulled, dried and weighed to adjust the rough field weights to in-shell nut weight. The southeast orchard was not harvested due to time constraints.

RESULTS

Midday stem water potentials in the northeast and northwest orchards ran near the fully watered baseline in early June through early July when they dropped off the baseline by about 4 bars or so. Midday stem water potentials in the southeast and southwest orchards were already substantially below the fully watered baseline at the first measurement date in late June.

The southeast and southwest orchard would have likely stopped elongation growth by mid July based on the midday stem water potentials falling below -9 bars at this time (Fig. 1). The northeast and northwest orchards would have likely kept growing through mid-August since this is when they reached below the -9 bar level of midday stem water potential (Fig. 1). The low midday stem water potentials earlier in the season are likely limiting canopy development in the southeast and southwest orchards.

Based on data collected in 2009, it appears that water potentials in July limited canopy expansion in the southeast and southwest orchards. In the northwest and northeast orchards, water potentials in August limited growth.

Water availability to the orchard was limited in 2009 and earlier years due inadequate well capacity. A new well drilled in 2009 should provide adequate water in 2010.
2010 PLANS

In 2010, we plan to start midday stem water potential measurements in the orchard earlier in the season (by early May) with the goal of preventing the depression in midday stem water potentials that occurred in the 2009 season.

ACKNOWLEDGEMENTS

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<table>
<thead>
<tr>
<th>Orchard</th>
<th>Year planted</th>
<th>Seasonal average MWSP (bars)</th>
<th>June-July average MWSP (bars)</th>
<th>Average midday light interception (%)</th>
<th>Average yield (tons/ac)</th>
<th>Average yield per unit PAR (tons/%par)</th>
<th>Average reflected light index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast</td>
<td>2003</td>
<td>-7.9 a</td>
<td>-6.1 a</td>
<td>26.2 b</td>
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<td>-6.0 a</td>
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<tr>
<td>Southeast</td>
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<td>-8.2 ab</td>
<td>-8.4 b</td>
<td>19.5 c</td>
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<tr>
<td>Southwest</td>
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<td>-8.5 b</td>
<td>-8.4 b</td>
<td>13.7 c</td>
<td>0.41 c</td>
<td>0.030 ab</td>
<td>56.0 a</td>
</tr>
</tbody>
</table>

*not harvested

Table 1. Seasonal average midday stem water potential, midday canopy light interception, yield and yield per unit PAR intercepted for each of the four orchards.

Fig. 1. Midday stem water potential over the season in the four Lake County orchards. Error bars indicate plus or minus one standard error. The fully watered baseline was calculated from temperature and relative humidity readings taken in the orchards during stem water potential measurements.