REGULATED DEFICIT IRRIGATION IN PEACH AND NECTARINE AT THE FARM LEVEL

González-Dugo, V.1, Ruiz, C.1, Berni, J.A.J.1, Suarez, L.1, Guillén-Climent, M.L.1, Zarco-Tejada, P.J.1, Soriano, M.A.2, Fereres, E.1,2

1 Instituto de Agricultura Sostenible, Universidad de Córdoba, 14004 Córdoba (Spain)
2 Universitat de València, Departamento de Ingeniería, Campus de Paterna, 46980, Valencia (Spain)

INTRODUCTION
Regulated Deficit Irrigation (RDI) consists of the application of water below the full crop-water requirements during periods of crop growth that are less sensitive to water deficit (Chalmers et al., 1986), and is a viable strategy during periods of water shortage (Fereres and Soriano, 2007). For stone fruits, such as peach and nectarine, the least sensitive stage to water stress is stage II of fruit development, characterized by a slow fruit growth rate and rapid vegetative growth. On-farm experiments in peach have shown that RDI scheduling based on stem water potential was a viable strategy that reduced applied irrigation water by 33%, relative to full requirements, without reducing yield or crop value. At present, there is a need for upscaling these results from experimental plots to commercial farms. This leap in space scale must be accompanied by adapting new tools that enable the early detection of water stress with higher spatial resolution thermal and narrow-band multispectral remote sensing imaging. Airborne thermal and multispectral imagery can provide pre-visual indicators of water stress (Berti et al., 2008; Suarez et al., 2008). RDI targeted to the stage III according to Fereres and Soriano (2007). To determine water status, midday stem water potential was measured weekly in 6 trees/treatment. At harvest, water applied, yield, fruit diameter and fruit number was determined. Thermal and multispectral cameras were installed in an unmanned aerial vehicle (UAV) flying at 150 m altitude. The images yielded 40 cm spatial resolution (320x240 pixels with 16-bits) in the thermal, and 20 cm pixel size in the visible and near-infrared multispectral camera. For more information concerning calibration, image capture and analysis, see Berti et al. (2008) and Suarez et al. (2008).

RESULTS AND DISCUSSION
As soil was near field capacity, stem water potential did not show any difference for the first 20 days in both, peaches and nectarines (Figure 1). Differences were maximal just before rewatering, reaching 0.3 and 0.2 MPa for peach and nectarine, respectively. The day before the rewatering period, the temperature map showed differences near 10°C between both treatments (Figure 2). After rewatering, both treatments followed a similar evolution until harvest. At the end of the season, the total water saved in RDI was equal to 63 and 108 mm for peach and nectarine respectively (Table 1). No differences were found in yield (Table 1) or quality parameters, such as total soluble sugars or total acidity (data not shown). RDI treatments resulted in a large number of smaller fruits (Table 1; Figure 3). No difference in fruit size or number was found in nectarine, and both treatments exhibited similar distribution (data not shown).

Table 1: Water applied (mm), fruit number (n/tree) and yield (kg/tree)

<table>
<thead>
<tr>
<th>Species</th>
<th>Treatment</th>
<th>Water applied (mm)</th>
<th>Fruit number (n/tree)</th>
<th>Yield (kg/tree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peach</td>
<td>R</td>
<td>465</td>
<td>170</td>
<td>42.4</td>
</tr>
<tr>
<td>Peach</td>
<td>RDI</td>
<td>402</td>
<td>195</td>
<td>40.8</td>
</tr>
<tr>
<td>Nectarine</td>
<td>R</td>
<td>312</td>
<td>256</td>
<td>44.5</td>
</tr>
<tr>
<td>Nectarine</td>
<td>RDI</td>
<td>204</td>
<td>253</td>
<td>45.2</td>
</tr>
</tbody>
</table>

CONCLUSION
RDI techniques are suitable for irrigation scheduling in commercial farms. Water savings will depend on the contribution from soil water storage. Thermal imagery is a valuable tool for farmers to quantitatively monitor the plant water status in order to control water deficit levels and schedule the irrigation events.

REFERENCES

For more information, please visit our webpage: www.rideco-consolider.com