The Effects of Multiple Daytime Fertigation on Yield and Fruit Quality of Peach

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Background

The Goulburn Valley region is a major producer of stonefruit in Australia. Irrigation and fertilizer inputs are crucial for consistent high yields of quality fruit. Reduced water allocation due to drought and the potential environmental impacts of excessive fertilizer have increased the pressure on the horticultural industries to improve irrigation and nutrient use efficiency. Recent development in fertigation such as open hydroponics has made available the ability to apply fertilizer and water at sub-daily frequency to match crop water and nutrient requirements. The objectives of this study were to investigate the effects of single weekly and multiple daily fertigation on yield and quality, plant water status, and root-zone water, nutrient and salt fluxes of peach trees.

Fig 1. Harvesting the experiment

Material and Methods

The experiment was carried out in a commercial 7 year old peach (cv. Taylor Queen) orchard near Tatura, in the Goulburn Valley of northern Victoria during the 2007/08 growing season (Fig. 1). The trees were spaced at 1.5 x 5 m between trees and rows, respectively, with Tatura trellis training. Four fertigation treatments were established: Weekly microjet fertigation, weekly drip fertigation, multiple daytime drip fertigation, and multiple daytime drip fertigation with mulch. Plots were arranged in a randomized block design with 5 replicates. Plot size consisted of 9 adjacent trees with a buffer tree at each end of the plot and a buffer row to each side of the plot. Observation of the grower's irrigation practice on leaf water potential was monitored in adjoining rows. Total fruit fresh weight and fruit number for each tree within a plot was recorded at harvest. Fruit soluble solids content (°brix) and firmness were measured on 20 fruit per plot at harvest. Leaf water potential (ψ_{leaf}) was measured once per week and leaf conductance was measured on suitable clear sky days. Wetting front detectors (Fig. 2) installed at 30 and 45 cm depth, were used to monitor root-zone salinity and nutrient fluxes.

Fig 2. Monitoring root-zone nutrient and salinity using a wetting front detector (Fullstop).

Treatment	Emitter rate (l/h)	Emitter no. per tree	Run time (h)
1. Weekly microjet fertigation (Microjet)	30	1	4.4
2. Weekly drip fertigation (Drip)	1	6	11
3. Multiple daytime drip fertigation (Multiple drip)	1	6	1
4. Multiple daytime drip fertigation plus straw mulch (Multiple drip + Straw)	1	6	1

Results and Discussion

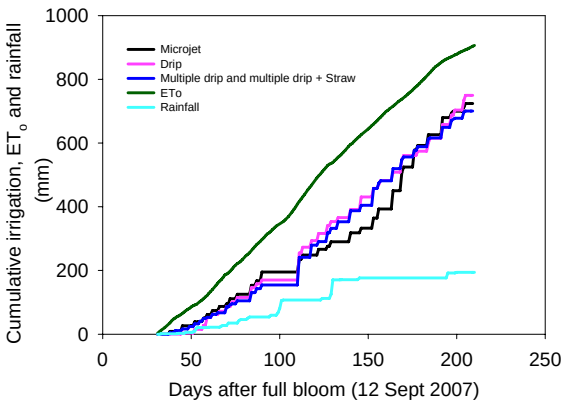

Fig 3. Cumulative irrigation inputs for each treatment, and ET_o and rainfall (mm) for the growing season.

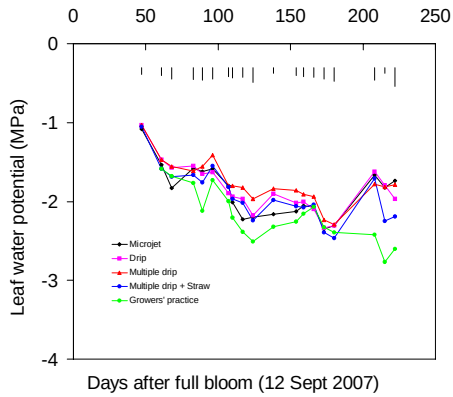

Fig 4. Effect of irrigation treatment on midday stem water potential for 'Taylor Queen' peach during the growing season. Vertical bars represent Fisher's LSD values for comparing treatment means.

Table 1. Effect of irrigation treatment on fruit weight, yield and fruit quality for 'Taylor Queen' peach.

Treatment	Fruit weight (g)	Yield (t/ha)	Soluble solids (°brix)	Firmness (kg)
Microjet	139	42.6	14.2	3.2
Drip	136	44.2	14.2	3.3
Multiple drip	147	42.4	13.2	2.8
Multiple drip + Straw	132	43.4	14.1	3.1

- Similar total amounts of irrigation were applied to the treatments however the microjet treatment received less water mid season compared with the drip treatments (Fig. 3).
- Mid season leaf water potential was less in the microjet treatment and in the adjoining rows (i.e. grower practice) corresponding to the period of slow fruit growth (RDI) (Fig. 4).
- Late season (post harvest) leaf water potential was less in the adjoining rows (i.e. grower practice) (Fig. 4).
- Yield and fruit quality were not influenced by irrigation treatments (Table 1).
- Measurements of nitrate and EC in samples collected from the wetting front detectors showed no consistent difference between the treatments (results not shown). Measurements have continued during the winter and these will be compared with model estimates of nutrient leakage.

Acknowledgement

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