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Plant Responses of Drip Irrigated Trees to Climate and Water Stress

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- Full Text

Past irrigation research has shown that peach (prunus persica) trees vary in their field response to water stress, and the degree of stress is a function of the plants' environment. Water deficits reduce plant growth and crop yields, therefore, measurements of plant water stress are fundamental in understanding how the environment affects plant performance. This in turn will facilitate the irrigator to have very precise water control and to determine optimum irrigation quantities.

This research examined the effect of environmental variables on leaf water potential, leaf resistance, canopy resistance and transpiration rate; and evaluated their ultimate effect on yield, water use efficiency and pruning weights for trees under four drip irrigation regimes at Stephenville, Texas. Treatments selected were instrumented with 1-, 2-, 3- and 4-emitters per tree, and single trees from each treatment were instrumented with ground covers.

Plant responses were measured hourly on sunlit and shaded leaves of each treatment.

Leaf water potentials and leaf resistances were higher in shaded leaves, resulting in reduced transpiration. An increase in early morning leaf water potentials indicated irrigation had decreased stress. Lower leaf water potentials and higher leaf resistance indicated the tress were being severely stressed prior to harvest.

Leaf water potentials decreased linearly, whereas leaf resistance decreased exponentially, with increasing solar radiation. In stressed trees critical leaf water potentials were lower suggesting some degree of adaptation to stress. Leaf water potentials decreased linearly with increasing transpiration. Total resistance (sum of plant and soil resistance) increased with increasing severity of stress.

The 3-emitter tree was recommended, since yield and water use efficiency are relatively high. Proper irrigation increased total yields and also the number of fruit within a marketable size range, while maintaining high water use efficiency, resulting in economic benefits to the farmer.

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