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Determining the Transpiration Rate of Peach Trees Under Two Trickle Irrigation Regimes

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- Full Text

The scientific design and management of a modern irrigation system requires that the designer or manager have knowledge of site and plant criteria such as infiltration, drainage, soil fertility, plant water needs, and plant production under varying conditions. With modern trickle systems water control is very precise and thus precise information on irrigation needs of a crop allow for the optimal use of water supplies.

Work has been conducted on the effects of trickle irrigation on peach trees in North Central Texas. Initial data relating trickle irrigation amounts to total production, peach size, and plant growth have indicated that trickle irrigation may provide benefits that would offset costs of the irrigation system and water. Previous work however has related these benefits only to the amount of water applied through irrigation and did

not consider the total water use of the tree.

Research was undertaken to determine the transpiration rate of peach trees under two trickle irrigation regimes. To determine the transpiration rate a volume of soil around the test trees was instrumented with neutron access tubes. Soil moisture depletion was measured weekly. A soil water balance was conducted equating evapotranspiration to the sum of the change in the soil moisture content (a decrease being positive) plus irrigation applied, plus any rainfall that occurred in the period.

For this work runoff and flux across the measurement zone boundaries was assumed zero. Estimates of evaporation from the soil surface were made using a two-stage evaporation process along with values of potential evapotranspiration made with the Penman (1956) equation. The estimates of evaporation from the soil surface were subtracted from total evapotranspiration to give estimates of the transpiration of the peach trees.

Estimates of transpiration were not consistent from one measurement period to the next. Errors in the estimation of evaporation from the soil surface directly affect the estimate of transpiration. During latter stages of a rain-free period an estimate of transpiration was made which should not have been influences by the low values of evaporation from the soil surface that existed. This method of estimating transpiration has many errors and can be much improved upon by using a method such as a lysimeter to estimate transpiration more accurately.

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