

Turkish Journal of Agriculture and Forestry

Turkish Journal

of

Agriculture and Forestry

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An Evaluation of Physically Based and Empirically Determined Evapotranspiration Models for Nursery Plants

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Abstract: A lysimeter study was conducted to determine the evapotranspiration (ET) rates of Red Sunset red maple (*Acer Rubrum* 'Red Sunset') nursery trees under outdoor conditions in August and September 1997. The average ET rate was 0.084 mm day⁻¹. This measured ET rate was compared with calculated ET rates based on four physical ET (i.e., Penman, Penman-Monteith, Stanghellini and Fynn) and two empirically determined ET models (vapor pressure deficit (VPD) and solar radiation based empirical ET models). The Penman-Monteith and Penman models overestimated the measured ET rate by 15% and 31%, respectively while the Stanghellini and Fynn models underestimated the measured ET rates by 19.7% and 16.3% with R² values of 0.70, 0.582, 0.645 and 0.644, respectively. The linear regression analyses showed that the single variables solar radiation and vapor pressure deficit each correlated with ET and R² values of 0.750 and 0.650 respectively. This study showed that VPD or solar radiation based empirical ET models could be used to predict ET rates of nursery plants if there is difficulty in running the physically based ET model due to a lack of input parameters.

Key Words: Transpiration, evapotranspiration, nursery production, combination models

Turk. J. Agric. For., **26**, (2002), 355-362.

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