Whole-Plant Water use and Canopy Conductance of Cassava Under Iimited Available Soil Water and Varying Evaporative Demand

Zeitschrift Plant and Soil
Verlag Springer Netherlands
ISSN 0032-079X (Print) 1573-5036 (Online)
Heft Volume 278, Numbers 1-2 / Dezember 2005
DOI 10.1007/s11104-005-0375-z
Seiten 371-383
Subject Collection Biomedizin & Life Sciences
SpringerLink Date Mittwoch, 30. November 2005

Whole-Plant Water use and Canopy Conductance of Cassava Under Iimited Available Soil Water and Varying Evaporative Demand

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Received: 16 March 2005 **Accepted:** 28 June 2005

Abstract Cassava (*Manihot esculenta* Crantz), a perennial woody shrub, is known to be highly productive under favourable conditions and produce reasonably well under adverse conditions where other crops fail. Using constant heat sap flow sensors, sap flow density (F_d) of cassava was monitored for 10 days in December 2002. Sap flow was highly correlated (R^2=0.72, P<0.05) to incoming solar radiation (R_s) than to other climatic factors. Using cross-correlation analysis, no time shift was detected between F_d and solar radiation, whereas vapour pressure deficit (VPD) lags F_d by 110 min. Solar radiation and VPD together explained 83% of diurnal variation in sap flow. Whole-plant transpiration ranged from 0.8 to 1.2 mm day^{-1} and daily canopy conductance (g_c), computed based on the inverted Penman–Monteith model, varied between 0.7 and 2.1 mm s^{-1} (mean = 1.4 ± 0.5 mm s^{-1}). For the measurement period, characterized by high evaporative demand coupled with low available soil water, transpiration accounted for 21% of the available energy and was only able to meet 24% of the atmospheric water demand. Average decoupling factor (Ω) of 0.05±0.02 estimated suggested that a 10% change in g_c may lead to more than 9% change in transpiration which further supports the notion that stomata play significant role in regulating cassava water use compared to other known mechanisms. Beyond light saturation (R_s>300 W m^{-2}) and at higher VPD (>1.0 kPa), wind effects on the canopy transpiration under water stress condition were low, while VPD explains 94% of the observed variance in daily canopy conductance.

Keywords canopy conductance - evaporative demand - limited soil water - *Manihot esculenta* - whole-plant transpiration

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