

Measurement of water-use by *Jatropha curcas* L. using the heat-pulse velocity technique

MB Gush*

CSIR, % Agrometeorology, School of Environmental Sciences, University of KwaZulu-Natal, Private Bag X01, Scottsville 3209, South Africa

Abstract

In response to the proposed introduction of the potential bio-diesel species *Jatropha curcas* (Linnaeus) to South Africa, field experiments were conducted to investigate its likely water-use impacts relative to other forms of vegetative land use. As no existing water-use data could be found for this species worldwide, sap flow in *Jatropha curcas* trees was measured continuously for a 17-month period at two sites in eastern South Africa. These consisted of young (4-year-old) trees at a relatively wet site and mature (12-year-old) trees at a dry site. The heat-ratio method of the heat-pulse technique was utilised, together with measurements of meteorological variables and soil water. Sap-flow rates varied according to tree age, season, prevailing meteorological conditions, and soil moisture levels. Peak sap-flow rates occurred during the warm wet summer months, but due to the deciduous nature of the species, water use was negligible during winter. Scaled-up sap-flow measurements resulted in estimates of total annual transpiration of 1 983 ℓ (147 mm) for a 4-year-old *J. curcas* tree, and 4 884 ℓ (362 mm) for a 12-year-old *J. curcas* tree. The study concluded that the *J. curcas* trees studied were conservative in their water use, and were unlikely to transpire more water than indigenous vegetation types of the area.

Keywords: heat ratio method, sap flow, transpiration, water resource impacts