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Leaf Gas Exchange and Growth Response of Juvenile 'Valencia' Orange to Dry Season Irrigation in Southwestern Nigeria

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Abstract

In August 2006 at Abeokuta southwestern Nigeria, 18-month old budded seedlings of 'Valencia' sweet orange (*Citrus sinensis* L. Osbeck) on Cleopatra mandarin (*Citrus reticulata*) rootstock were transplanted 3.5 m apart. Between January and April 2007 which corresponded to the dry season, the seedlings were irrigated with 7.5, 30 and 60 l water plant⁻¹ week⁻¹. The aim was to determine if juvenile sweet orange plants responded to dry season irrigation, the critical volume of water for growth and by which mechanism irrigation exerted its influence on vegetative growth. Local farmers do not irrigate their juvenile citrus plants during the dry season. Effects of dry season irrigation on photosynthesis and transpiration were determined using the CIRAS⁻¹ leaf gas exchange metre in the morning (9–10am), afternoon (1–2pm) and evening (5–6pm). Growth was determined using measurements of plant height, number of leaves and leaf area of citrus plants taken at 2-week intervals. Application of 30 l water week⁻¹ enhanced photosynthesis of citrus in the morning, afternoon and evening, while 7.5 and 60 l water week⁻¹ decreased it. Conversely, application of 7.5 l water plant⁻¹ week⁻¹ significantly decreased morning afternoon and evening transpiration while application of 30 or 60 l water plant⁻¹ week⁻¹ enhanced it. Compared with application of 7.5 l water plant⁻¹ week⁻¹, application of 30 l water plant⁻¹ week⁻¹ significantly increased plant height and leaf area but 60 l water plant⁻¹ week⁻¹ decreased it. Effect of irrigation on number of leaves was not significant. Irrigation influenced the growth of citrus by influencing photosynthesis. Irrigation cycles of 7.5 l water plant⁻¹ week⁻¹ induced water stress while 60 l water plant⁻¹ week⁻¹ induced water logging conditions. Water stress and water logging impaired photosynthesis and growth of citrus. Irrigation with 30 l water plant⁻¹ week⁻¹ is considered critical for optimum photosynthesis and vegetative growth of juvenile sweet orange seedlings during the dry season. The application of 30 l water plant⁻¹ week⁻¹ is recommended to citrus growers in southwestern Nigeria

Keywords: Citrus, irrigation, water stress