



LEAF GAS EXCHANGE AS INFLUENCED BY
ENVIRONMENTAL FACTORS IN MANGO
CULTIVARS (*MANGIFERA INDICA L*), GROWN IN
THE SEMI ARID TROPICS

BY

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Peter R Johnson

(24/7/98)

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ABBREVIATIONS

ABA	Abscisic Acid	
C_i	Internal carbon dioxide concentration	$\mu\text{L L}^{-1}$
D/N	Day/Night	
E_1	Transpiration	$\text{mmol m}^{-2} \text{s}^{-1}$
fd	Fruit development	
fl	Flowering	
g_s	Stomatal Conductance	$\text{mmol m}^{-2} \text{s}^{-1}$
ha	Harvest	
Irr	Irrigated	
IRGA	Infra Red Gas Analyser	
T_1	Leaf temperature	$^{\circ}\text{C}$
LGE	Leaf Gas Exchange	
MT	Metric Tonne	
Nir	No Irrigation	
NMP	Neutron Moisture Probe	
ORIA	Ord River Irrigation Area	
P_{max}	Maximum Net Photosynthesis	$\mu\text{mol m}^{-2} \text{s}^{-1}$
P_n	Net Photosynthesis	$\mu\text{mol m}^{-2} \text{s}^{-1}$
PPF	Photosynthetic Photon Flux	$\mu\text{mol quanta m}^{-1} \text{s}^{-1}$
PPFD	Photosynthetic Photon Flux Density	$\mu\text{mol m}^{-2} \text{s}^{-1}$
RH	Relative Humidity	%
SE	Standard Error	
SMC	Soil Moisture Content	cm
VPD	Vapour Pressure Deficit	kPa
VMC	Volumetric Moisture Content	
ψ_1	Leaf Water Potential	MPa

ABSTRACT

Leaf gas exchange (LGE) of mango cultivars Kensington, Irwin and Tommy Atkins was investigated in a series of field experiments under varying environmental and physiological conditions. These experiments were conducted in the Ord River Irrigation Area Kununurra Western Australia

1. The effect of photosynthetic photon flux density (PPFD) at the leaf surface was studied. Light saturation of photosynthesis of mature leaves occurred between 1250 – 1500 $\mu\text{mol m}^{-2} \text{s}^{-1}$ on Kensington, Tommy Atkins and Irwin between 1250-1750 $\mu\text{mol m}^{-2} \text{s}^{-1}$. There was no significance ($P \leq 0.05$) between cultivars.
2. Mango leaves reached their full size at four weeks after emergence. Maximum Pn, and g_s was reached 5 weeks after leaf emergence. Cultivar had no influence on the results.
3. Pronounced diurnal variations in Pn, g_s , E_1 and C_i were observed as a result of fluctuating vapour pressure deficit. Pn, g_s , and E_1 were significantly lower in cultivar Kensington during periods of high VPD (Dry Season), However little cultivar difference occurred during periods of low VPD (Wet season). Since high VPDs are commonly experienced during the period of fruit development, carbon assimilation may become limited by stressful atmospheric conditions as the day proceeds. An inverse relationship existed between g_s and VPD in all cultivars. Seasonal Pn, g_s , and E_1 variations were more pronounced than the variations between cultivars.
4. A significant reduction in Pn was observed on leaves adjacent to developing fruit with both Kensington and Irwin cultivars. It is assumed that the fruit may primarily affect stomatal aperture with subsequent effects on Pn and E_1 of the leaves. Possible mechanisms leading to such effects are discussed.

5. Non irrigated trees had a significant reduction in g_s and later a reduction in P_n , when compared to irrigated trees although no significant differences in LGE were observed between cultivars. Kensington responded with a reduction in fruit size whereas Irwin was observed to have greater fruit drop and leaf abscission.