

WATER POTENTIAL IN THE LEAVES OF COCONUT (*COCOS NUCIFERA* L.) UNDER RAINFED AND IRRIGATED CONDITIONS

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Water potential (Ψ leaf) in a plant, which is the energy level of water, is controlled by the availability of water from the soil, the demand for water imposed by the atmosphere and the resistance to water movement within the plant (Dee Roo, 1969). The changes in water status of plants depend on the evaporative demand in the atmosphere. In the present paper an attempt has been made to study the Ψ leaf gradient between leaves of different physiological maturity over a period of time with the objective of identifying the critical leaf and time for Ψ leaf determinations in the screening of coconut genotypes for drought tolerance.

Twenty-two-year-old West Coast Tall cultivar grown both under rainfed and irrigated conditions with normal fertiliser level was the material for the study. Leaf water potential was determined from five leaf positions, namely, spindle, first, sixth, fourteenth and twentieth, using a Scholander pressure chamber, plant water console (model 3000, Soil Moisture Co., USA) according to the method of Milburn and Zimmermann (1977) and modified by Rajagopal *et al.* (1987). The measurements were made at three-hour intervals starting from 0700 hours to 1600 hours.

The results are presented in Table 36.1. Vertical profile in Ψ leaf has been observed from middle leaf upwards, the magnitude being higher under rainfed condition. Irrespective of rainfed or irrigated condition the spindle leaf maintained significantly higher Ψ leaf throughout the day. During the early hours (0700 hours) the Ψ leaf difference between the spindle leaf and the twentieth leaf was nearly -0.38 and -0.26 MPa respectively under rainfed and irrigated conditions, while within the spindle leaf the difference was negligible. Under rainfed condition there was 58 per cent reduction in the Ψ leaf from the spindle leaf to the first leaf.

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Soon after sunrise the ψ leaf began to decrease in all the leaf positions, particularly in the spindle leaf. Leaf ψ declined rapidly up to mid-day and then rose beyond noon. The results clearly indicated significant differences between hours of sampling, leaf positions, rainfed versus irrigated condition and all their interactions, except hours of sampling versus different leaf positions (Table 36.1).

Table 36.1: Leaf ψ (—MPa) in different leaf positions over a period of time

Treatment/time (hours)	Leaf position				
	Spindle	1st	6th	14th	20th
Rainfed					
7	-4.1	-6.7	-7.7	-8.7	-8.0
10	-8 J	-10.4	-13.3	-12.8	-13.2
13	-10.3	-10.3	-12.3	-13.7	-13.3
16	-9.3	-10.1	-12.2	-13.9	-11.4
Irrigated					
7	-3.3	-4.6	-4.9	-4.7	-5.8
10	-8.8	-9.9	-11.4	-11.2	-10.1
13	-10.8	-14.2	-14.0	-13.2	-11.2
16	-10 J	-12.9	-13.8	-13.4	-13.8
SE/plot	-1.302	G.Mean -10.279	CV 12364	CD for I -0.474	
CD for L	-0.749	CD for R vs I x L -1.059	CDforRvslxH XL -2.118		
CD for H	-0.67	CDforRvslxH -0.245			

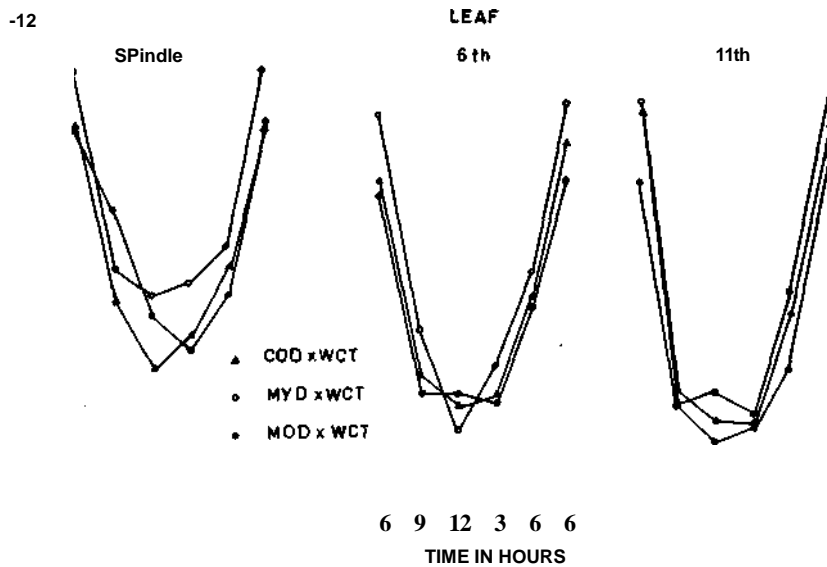


Fig. 36.1: Gradient in the leaf water potential (ψ) in the three hybrids.

Although the overall differences in V leaf were the same between the rainfed and irrigated conditions by 1000 hours and 1300 hours the gradient was much steeper in the irrigated condition, presumably because of the very high *ip* leaf during the early hours in the irrigated palms. Characteristic mid-day depression in *if* leaf was evident in both the spindle and the first leaf and beyond this *ip* leaf remained constant up to 1600 hours as compared to the first leaf. Similar observations have been recorded in the three year old hybrids of Malayan Yellow Dwarf (MYD) x WCT, Malayan Orange Dwarf (MOD) X WCT and Chowghat Orange Dwarf (COD) x WCT. In general, spindle leaf maintained higher V leaf than the 6th and 11th leaf throughout the day. Among the hybrids MYD X WCT had relatively high V leaf (Fig. 36.1).

The present study reveals the existence of vertical profile in V leaf over a period of time, and also confirms the importance of fixing the spindle leaf as the index leaf, as well as optimum time for leaf water potential measurements (between 1000 hours and 1200 hours) in coconut palms.

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