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## **5. AGRO-BIODIVERSITY**

## Adaptive Mechanism of Coconut palms in the Changing Environment Conditions for Higher Production

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Coconut, a perennial tree of long life and continuous production is a crop of tropics mainly cultivated under the rainfed condition. Nut production of this crop is hampered by limited water supply or high frequency of soil water deficit during summer months. In such a condition productivity can be increased by identifying the varieties which can withstand the adverse conditions of soil and atmospheric droughts and with high yield potential under such condition.

In the present paper a critical analysis has been made to elucidate the adaptability of coconut palms to the changing environmental condition and for high yield stability during stress period. Coconut with a long productive period above 60 years has to adapt to the environmental condition during the growing season. In spite of heavy rainfall, northern Kerala faces water scarcity during summer months than southern Kerala. This is mainly due to the fluctuations in the distribution of rainfall in both the places. Fluctuation in weather parameters is a common phenomenon at Kasaragod, north Kerala with a rainless period extending from four to six months in an year. Based on weather factors, the north Kerala is considered

as drought intensity area as compared to southern Kerala (Table 1). The time taken for the unopening of leaf and spathe differed in the two regions (Table 2), indicating the influence of dry spell on these characters.

Evaluation of the coconut germplasm *viz.* Talls, Dwarfs and <sup>hybrids</sup> for their performance during the rainy and summer months revealed that some of the Talls (WCT, FMS, PO) and some of the hybrids (WCT × WCT, WCT × COD, LO × GB, and LO × COD) showed higher adaptability in terms of higher stomatal resistance coupled with lower transpiration rate, higher leaf water potential and higher wax content to the changing environmental and water deficit conditions than the others. For instance, deposition of wax differed among the genotypes in different seasons (Fig. 1). These genotypes maintained higher WUE (Table 3) and HI than to those with low adaptability to these changing environmental conditions.

In-depth analysis of the physiological (stomatal regulatory mechanism, osmotic adjustment and water relation components), anatomical (cell thickness, cuticular thickness and cell

Table 1. Agroclimatic variables in north and south Kerala

	Temperature °C (Range)		Rainfall mm. year <sup>-1</sup>	Humidity % (Range)		Sunshine Hrs. day <sup>-1</sup>		Evaporation mm day <sup>-1</sup>
	Max.	Min.		Max.	Min.	Max.	Min.	
N. Kerala	38.7-33.4	25.3-21.4	3700	94-76	94-54	9.5	2.0	6.5
S. Kerala	34.5-30.2	25.0-21.2	2480	95-90	85-07	10.4	1.9	4.7

Table 2. Response of coconut palms to high and low drought intensities (North Kerala and South Kerala)

Characters	WCT		COD × WCT	
	N. Kerala	S. Kerala	N. Kerala	S. Kerala
No. of days for leaf opening	55	52	57	54
No. of days for spathe opening	72	66	55	77
Nut yield palm <sup>-1</sup>	78	96	106	116
Copra weight (g)	133	167	135	169

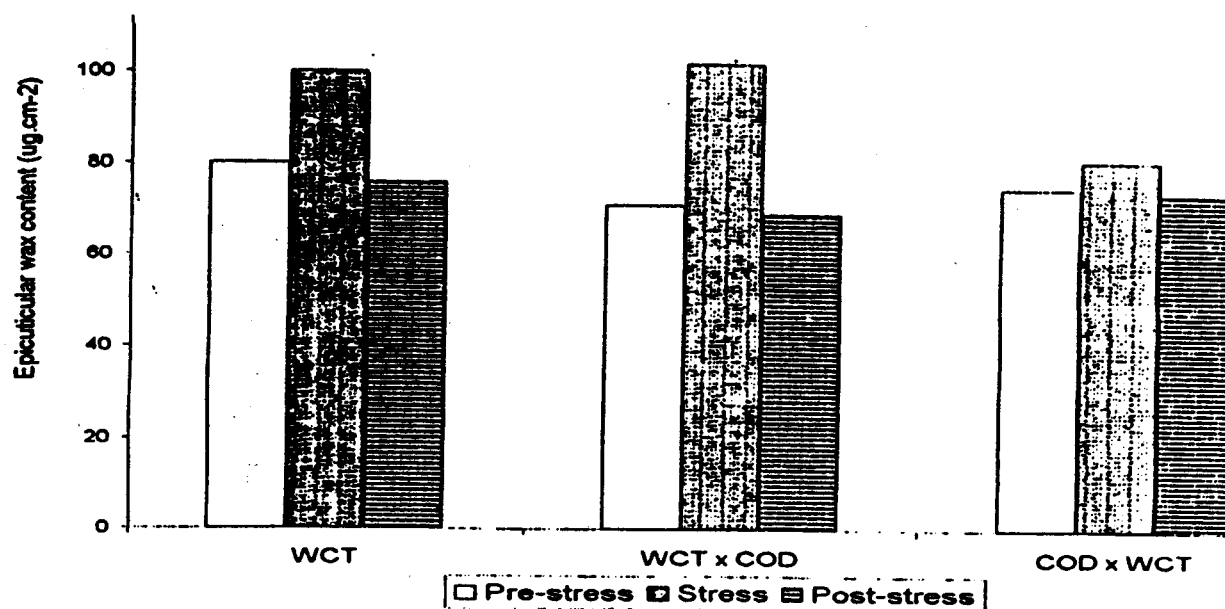


fig. 1. Seasonal changes in epicuticular wax content

Table 3. Seasonal changes in stomatal conductance ( $\text{mol. m}^{-2} \text{ s}^{-1}$ ) and WUE ( $\mu \text{mol CO}_2 \text{ mmol}^{-1} \text{ H}_2\text{O}$ ) in coconut genotypes

Genotypes	Stomatal conductance		WUE	
	Oct-Nov*	Mar-April**	Oct-Nov*	Mar-April**
WCT	0.45	0.14	0.83	0.80
WCT x WCT	0.51	0.15	0.88	0.88
WCT x COD	0.39	0.14	1.14	0.96
LO x GB	0.35	0.15	1.22	1.18
LO x COD	0.35	0.12	1.02	0.99
COD	0.31	0.16	1.07	0.86
MYD	0.50	0.16	0.83	0.80
GB	0.43	0.15	0.88	0.81
COD x WCT	0.37	0.14	1.14	0.91

\* Non-stress, \*\*Stress

organization), biochemical (activities of stress sensitive enzymes and maintenance of cell membrane integrity) and dry matter production (vegetative and reproductive dry matter production) water use efficiency and harvest index

characteristics revealed the adaptive mechanism of these genotypes to the changing environmental conditions and for higher stability in yield. A clear difference in the reproductive dry matter between the seasons was noticed in the genotypes.