Performance of Coconut Cultivars Under Different Soil Types

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The growth, development and productivity of any crop depends on various environmental factors *viz.* soil factors (soil type, soil characteristics and water holding capacity) and atmospheric factors which include humidity, temperature, precipitation and evaporation. Impact of all these factors on the production of coconut palm has been widely reported. Studies on the impact of weather variables on the harvest of coconut, identified seven lag periods such as primordial initiation, male and female phase, ovary development, spathe opening, fertilization, button size, size of mature nut. Among the variables rainfall has positive influence consecutively on five of the seven lag periods while other veriable like temperature and relative humidity have the influence on two or three lag phases. From the study on the ontogeny of inflorescence in relation to drought, it has been observed that coconut production under non irrigated condition is influenced significantly by the length of dry spells at the above mentioned critical periods. Extreme climatic variables are also found to be deleterious to coconut production.

Rainfall is one of the important parameters that influences the growth of the palm. Total rainfall *per-se,* is not an important parameter, but its distribution and percolation into the soil is very important, since coconut is mainly cultivated as a rainfed crop. Percolation of rain-water, soil moisture retention, storage, movement and availability in the soil depend on the soil characteristics and water holding capacity of the soil. Since coconut is grown widely under coastal sandy, sandy loam and laterite soils the performance of cultivars/hybrids growing under these soil types will give an insight into its yield variation.

The work at CPCRI, Kasaragod indicated that under sandy loam soil, 110 mm is the critical level of soil water deficit at which coconut suffers most in terms of CO_2 assimilation and biomass production. Bending and breaking of leaves, poor spathe development, shedding of buttons and reduction in nut yield are some of the adverse effects of water deficit on the morphology of coconut palms. When exposed to moisture stress over a period of 16 to 24 days vegetative drymatter production reduced by 15% to 18% where as reproductive dry matter production reduced by 20% to 22%. Coconut palms developed severe stress affecting both vegetative and reproductive dry matter production even under irrigation with 20 mm of water at IW/CPE ratio of 0.5

indicated that in terms of growth, yield and copra production, the performance of palms growing in Kayangulam was found to be better than Kasaragod inspite of the prevalence of root (wilt) disease. Even the time taken for the opening of the leaf and spathe varies significantly between the two places. The reason for better performance of the palms at Kayangulam can be attributed to even distribution of rainfall, thus maintaining soil moisture than Kasaragod where dry summer period extends to four to five months in an year starting from December to May. Although coconut experiences severe soil water deficits during March to May, 40 to 60% of the yield is realized during these periods.

In Kasaragod even the performance of same genotypes of comparable age (18 years old) was

Performance of coconut palms under different drought intensities

Cultivar/hybrid	WCT		CODx WCT (Chandrasankara)	
	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	78	96	106	116
Copra weight (g)	133	167	135	169

Even, the geographic location of palms also influences the growth and productivity of palms. Observations were recorded on two genotypes *viz.* local tall variety (WCT) and Chandrasankara (COD x WCT) of same age and growing conditions at Kasaragod (North Kerala) and Kayangulam (South Kerala) deferring in drought intensities. The data found to vary significantly when grown in sandy loam and laterite soil. It was found that the palms growing in sandy loam soil suffered more due to water deficit than those growing in the a summer months. The reason being higher water holding capacity of laterite soil than the sandy loam soil. As the soil moisture status in these soils differs, reflecting on the

water holding capacity, the physiology of palms growing in these soils also was found to vary.

As compared to non-stress period (October-November), during stress period (March-April) the soil moisture content in sandy loam soil was found to decrease by 48% to 61% as against 35% to 50% in laterite soil. Water holding capacity of the soil influences the physiology of coconut cultivars/ hybrids differentially in terms of stomatal regulation, leaf water status and turgor maintenance. Among the three coconut cultivars *viz.* WCT, Kerasankara and Chandrasankara, WCT did not show much variation in the maintenance of turgor between the two soil types where as the hybrids exhibited higher adaptability in the laterite soil than in sandy loam soil. These hybrids maintained higher turgor by closing stomata thus regulating the transpiration rates in the laterite soil than the sandy loam soil. The response of Chandrasankara is marked between the soil types. This implies that during summer months hybrids under rainfed conditions suffer more in sandy loam than laterite soil.

Even the nut yield showed great variation among the genotypes between the two soil types. In general, the nut yield was higher in palms under lateritic than in sandy loam soils. Among the three genotypes the yield variation was not much in local tall variety (WCT) and Kerasankara between the two soil types. In the case of Chandrasankara the yield was higher in laterite soil (101.1) than in the sandy loam soil (57.7). This indicates the relative sensitivity of the genotypes to soil moisture stress.

bunch production (42%) female flower production (22%) setting (46%) and yield (75%) as compared with Kerasankara where the reduction was only 31%, 25%, 29% and 64% respectively. Correlation worked out between the drought tolerant traits and nut yield was also found to be positively correlated in the laterite soil than in the sandy loam soil.

The observations clearly show that palms exhibit the adaptability to the stress condition through the intricate

Table 2 : Yield / palm / year in coconut cultivators / hybrids

Genotype	Soil type	
	Sandy loam	Laterite
WCT	78.3	66.1
Kerasankara	112.9	102.7
Chandrasankara	57.7	101.1

This can be attributed to the higher water retention capacity of the laterite soil due to high clay content. Even between the normal and drought influenced years Chandrasankara suffered more during drought situations in terms of reduction in mechanism of water relations of tissues which depend on the genotype as well as soil characteristics. That Chandrasankara should not be recommended under sandy loam soil especially when water resources for irrigation are scanty, is the highlight of the study.

CPCRI selected the coconut garden of Shri. Sebastian P. Augustin, Palamattom, Beemanadi, Kasaragod (Kerakesari 1998-99) as the best garden in the competition organized in connection with the Kisan Mela 2000. He received the award from Shri. Dhananjay Kumar, Union Textiles Minister at a function held at CPCRI on 10th December, 2000.