VARIETAL RESISTANCE STUDIES

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Plants which resist a disease are perhaps the best practical solution in cases of difficult-to-cure diseases. A polygenic resistance is usually sought after especially where many races of a pathogen are known to occur. Field screening of the available germplasm can help in identifying resistant varieties. Apparently healthy plants in a heavily diseased area may be disease escapes/resistant ones and are desirable in breeding work to evolve resistant types. Efforts on such lines have been fruitful in the case of Malayan Dwarf coconut which has been found tolerant to lethal yellowing disease of coconut in Jamaica. Now attempts are made to have hybrid combinations to such varieties eg. Maypan (Malayan Dwarf x Panama Tall) to couple high yield with disease resistance.

In Kerala also similar attempts are in progress by screening the available varieties and their hybrids against coconut root(wilt) disease. Pioneering attempts in this line were made by Varghese(1934). He surveyed about 10 sq. km. in and around Kayangulam - a highly diseased area, and classified the palms on the basis of colour, shape and size of nuts. He had then observed 59 per cent disease incidence but did not find resistance in any of the varieties in the area. Studies made at the Central Plantation Crops Research Institute, Kayangulam during 1951 to 1968 has indicated that open pollinated progenies of healthy parents of coconut from disease-free area performed better than those from disease affected palms. Disease development was less and yield higher in the former group (Annual report, CCRS, 1963-68).

Attempts to locate disease resistance/tolerance in the coconut germplasm available at the CPCRI farm Kayangulam during 1961 showed that all the materials evaluated in the field developed symptoms characteristic of root(wilt) disease. The varieties tested were Andaman Ordinary(AO), Andaman Giant(AG) Cochin China(CC), Ceylon, FMS, Fiji,

Java, Kongthion Young, Laccadive Dwarf(LD) Laccadive Ordinary (LO), New Guinea(NG), Philippines(Phil); SS Apricot(SSA), Strait Settlements; St. Vincent and Spikeless(See Annual Report, CCRS 1967). A draw back in this experiment was that they were not progenies of nuts obtained from controlled pollination.

Rawther and Pillai(1972) reported that Natural Cross Dwarf coconuts(NCD) exhibited superiority in tolerance to root(wilt) and yield performance compared to WCT. According to them, among bearing palms, both in healthy and diseased tracts, NCD recorded highest yield followed by TxD, Dwarf Orange, Dwarf Green and WCT. They also contented that the disease made its appearance usually in WCT seedlings older than five years remarkably reducing the yield. Percentage of disease incidence in seedlings and bearing palms was lower in hybrids than in others in the corresponding age groups.

Another survey taken up in the cultivators' fields in the latter half of 1972 showed that the percentage disease incidence was 9.3 in DxT, 11.4 in TxD, 37.5 in WCT, 22.9 in DO and 10.4 in DG (Unpublished data).

Since most of these observations were made from palms of uncertain parentage and also in the absence of definite characters to identify them into different groups such as NCD, DxT etc., large scale field experiments were taken up both in CPCRI Regional Station Kayangulam and also in cultivators' gardens with seedlings of known parentage developed at CPCRI Kasaragod- a known healthy area. For this purpose one year old seedlings of available cultivars(36) and hybrids(53) were planted in different soil types in 63 villages in Alleppey, Quilon and Kottayam districts. They included (1) locally available cultivars such as West Coast Tall (WCT), Laccadive Ordinary(LO), Laccadive Micro(LM), Anandaman Ordinary(AO), Andaman Giant AG), Kulasekharam Dwarf Orange(KDO), Chowghat Dwarf Green(CDG), and Chowghat Dwarf Orange(CDO) (2) hybrids of local cultivars such as West Coast Tall x Dwarf Orange(TxD), Dwarf Orange x West Coast Tall(DxT), West Coast Tall x Gangabondam(TxG), Dwarf Orange x Dwarf Green(DOxDG), West Coast Tall x West Coast Tall(TxT), Dwarf Orange x Gangabondam(DOxGb) Laccadive x Dwarf Orange(LxDO), Laccadive x West Coast Tall(LxWCT), West Coast Tall x Gangabondam(WCTxGb), West Coast Tall x

Spicata(WCT x Spicata), West Coast Tall x Laccadive Ordinary(WCT x LO), West Coast Tall x Laccadive Micro (WCT x LM), West Coast Tall x Dwarf Green(WCT x DG), Spicata x Laccadive Ordinary(Spicata x LO), Spicata x Laccadive Micro(Spicata x LM), Spicata x Gangabondam, (Spicata x Gb), Spicata x Dwarf Orange(Spicata x DO), Spicata x Dwarf Green (Spicata x DG), Dwarf Orange x Spicata(DO x Spicata), Dwarf Orange x Dwarf Orange(DOxDO), Dwarf Green x East Coast Tall(DG x ECT) and Ayiramkachi x East Coast Tall (Ayiramkachi x ECT); (3) introduced cultivars such as Philippines(Phil.), Malayan Dwarf Green (MDG), Malayan Dwarf Orange(MDO), Malayan Dwarf Yellow(MDY), Java, Fiji, Strait Settlement Green(SSG), Java Giant(JG), Federated Malay States(FMS),Cochin China(CC), S.S. Apricot (SSA), Ceylone Tall, Philippines Lono(Phil. Lono), Kenya, Zanzibar, Jamaica, Seychelles, San Ramon(San), Guam, Borneo, Gunthombeli, British Solomon Island, St. Vincent, Philippine Leguna (Phil. Laguna), Klapawangi, Kendali, Nigerian Dwarf and Nigerian Tall; (4) hybrids of introduced cultivars such as West Coast Tall x Malayan Dwarf(WCT x MD), Fiji x Java) Cochin China x St. Settlement Yellow(CC x SSY), SS Apricot x Dwarf Orange (SSA x DO), Laccadive x Jamaica (L x Jamaica), Laccadive x New Guinea (L x NG), Laccadive x Gangabondam(Lx Gb), Fiji x Jamaica(FxJ), Fiji x New Guinea(FxNG), Java x SS Green(Java x SSG), Malayan Dwarf Orange x Java Giant(MDOx JG), Malayan Dwarf Yellow x Java Giant(MDY x JG), Java x Malayan Dwarf Orange(Java x MDO), Java x Malayan Dwarf Yellow (Java x MDY), Malayan Dwarf Green x Java (MDG x Java), Laccadive x Fiji (L x Fj), Laccadive x Java(L x Java), Fiji x SS Green(Fiji x SSG), SanRamon x Fiji(San x Fj), West Coast Tall x San Ramon(WCT x San), Laccadive x SS Green (L x SSG) and Fiji x Gangabondam(Fiji x Gb); (5) Segregants (DxT) of Chowghat Dwarf Orange x West Coast Tall(CDO x WCT), Chowghat Dwarf Green x West Coast Tall(CDG x WCT) Kulasekharam Dwarf Orange x West Coast Tall (KDO x WCT) and Kulasekharam Dwarf Green x West Coast Tall(KDG x WCT).

One of the criteria for selection of plots for field evaluation was the occurrence of at least 40% root(wilt) incidence in existing palms. Four plots were selected two in laterite and (two in reclaimed clay soil in Kuttanad) where disease intensity was lower.

Planting was first taken up in 1968 in two cultivators' gardens. The first plot contained WCT, Dwarf Orange(DO), Malayan Dwarf Green(MDG), TxD, DxT and TxG. In the second plot only WCT, DO, TxD, TxG and DxT were planted. Both the plots are situated in laterite soil. In 1972, other than the above, 21 more cultivars and hybrids were planted. Later, from 1973 onwards more cultivars/forms were planted and trials are being continued. Half yearly observations are recorded so as to collect data on the extent of susceptibility and yield performance under varying intensities of disease.

In the seedlings planted in 1972, the percentage disease incidence is on an average, 34 in WCT, 38.7 in DxT, 27.2 in TxD, 30.5 in TxG and 22 in DO in sandy loam soils; 22, 31, 36, 25, 9.5, respetively, in laterite soils; 50, 45.5, 53.1, 60 and 26, respectively, in alluvial soils; 52, 51.7, 71.0, 53.6 and 47.5, respectively, in reclaimed clay soils. A perusal of the above data reveals that there is no appreciable difference in disease incidence in the above varieties except that incidence is less in laterite soil. Another interesting observation is that flaccidity could be recorded in a few of WCT, LO, AO, AG, Philippines, KDO, LM, TxT, TxD, TxG, Malayan Dwarf x Java, Java x GB, L x Java, Java x MDG, Java x SSG, LxWCT, L x Fiji, San x Fiji and Fiji x SSG within 30 months of planting in various soil types. Twenty one cultivars and hybrids such as SSA, Ceylon Tall, Zanzibar, Jamaica, Borneo, Kenya, San Ramon, Klappawangi, FMS, L x SSG, Fiji x GB, San Ramon x WCT, WCT x SanRamon, Java x SSG, Spicata x LM, DO x Spicata, Tall x Dwarf Green, Laccadive x New Guinea, L x Java, SSA x DO and L x GB have not taken up the disease till 1980. The varieties planted in Coconut Research Station Kumarakom also showed root(wilt) disease in SS x SS, AG x AG, T x Yellow Dwarf F x F, T x MYG, (Tall x Mycorgabing) Bengal x Bengal, TxSS (Tall x St. settlement) NCD, GD x SS, GD x Tenpiley, Bengal x LD, TxLD(Tall x Laccadive Dwarf) TxAD(Tall x Andaman Dwarf), Bengal x GB, AO x AO, NG x NG, LO x LO, LS x LS, Java x Java and Philippines x Philippines(Mathai,1980)

The 24 cultivars and hybrids of coconut planted in 1971 on bunds in the reclaimed soil at Coconut Research Station, Kumarakom showed high incidence of disease in all categories (personal communication). The higher incidence could be

due to the pre-disposing factors such as high humidity, continuous availability of soil moisture and other soil factors and underplanting in a highly diseased area. However, the disease percentage in the cultivars/hybrids planted in the farm at CPCRI Regional Station, Kayangulam when compared to those planted in the cultivators' fields is less. Radha (1977) held that coconut seedlings planted in the fields after removing all diseased palms contracted the disease to a lesser extent - (2%) as compared to those planted between diseased palms(10-15%). The low incidence could be due to the better management practices and also the removal of all diseased palms from the plot before replanting. This could have reduced the inoculum potential considerably.

It may be pertinent to point out some of the lacunae in the screening trials conducted in the cultivators' gardens. All the cultivars/hybrids were not planted in the same year in the same plot of the same soil type. The package of practices adopted by the farmers and percentage of disease incidence varied from plot to plot. Many plots had inundation/stagnation of water. The small number of plants in each plot has been a limiting factor on the scope of drawing conclusions. In the light of the above handicap it may be worthwhile that at least 100 seedlings of promising types of known parentage are planted in different soil types again to watch their performance. Package of practices for all the plots are to be uniform. Screening of more germplasm from coconut growing tracts of the world may be carried out. In the event of availability of a resistant type, steps are to be taken to multiply them. More phenotypic studies of the high yielding immune plants in the diseased tract are warranted to identify characters which could be correlated for resistance at seedling stage. Crossing with other related species for inheriting resistance may also be taken up.

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