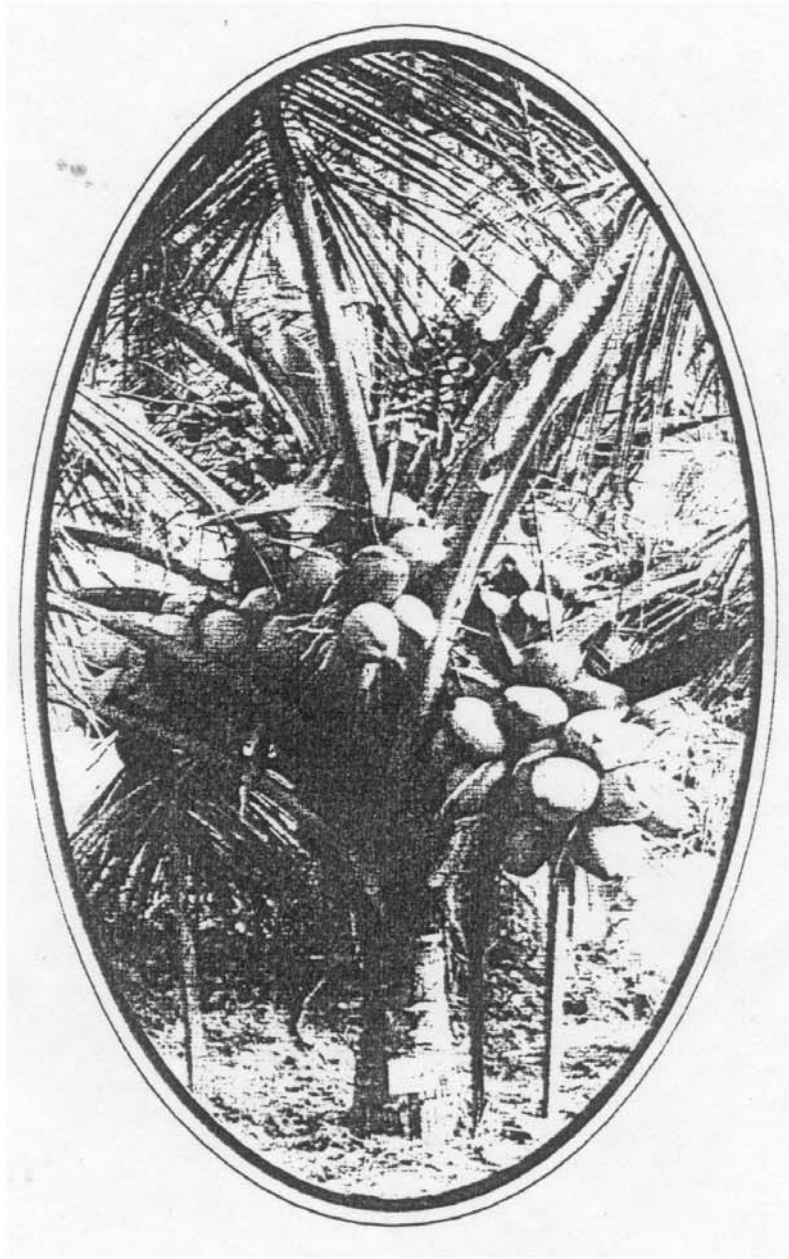


# STUDIES ON THE REACTION OF COCONUT GENOTYPES TO ROOT (WILT) DISEASE



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## SUMMARY

1. A total of fifty cultivars and twenty five hybrid combinations available at C.P.C.R.I. Kasaragod which has got the world's largest coconut Germplasm Collection, were screened in 'hot spots' for evaluating their field tolerance/resistance to coconut root(wilt) disease. None of the above cultivars/hybrids has shown the desired level of yield or resistance/tolerance to the disease. However, the cultivars, Andaman Ordinary and Philippines Ordinary, which have not taken up the disease in the initial years of planting, have recorded only less than 50% disease incidence in contrast to other cultivars. This marginal resistance/tolerance can be further upgraded by recurrent selections in the 'hot spots', in view of their high-yield potential.

2. Of the 25 hybrids screened against root(wilt) disease, the two combinations - COD x WCT and WCT x COD, inspite of contracting the disease, yielded better than others. The two hybrids reacted differently in different locations. In the experiments conducted at C.P.C.R.I. (RS) Kayangulam, WCT x COD hybrids gave the maximum annual per palm yield of 52.5 nuts, inspite of a heavy disease incidence of 91.6% when compared to COD x WCT hybrids with cent percent disease incidence and 32.8 nuts, but the results from the trials laid in farmers' plots during the same period, have revealed that the hybrid COD x WCT gave maximum average per palm yield of 92.4 nuts with 50% disease incidence, followed by WCT x COD with 78 nuts and 75% disease incidence in the 13<sup>th</sup> year of planting. The WCT palms in the control inspite of a low disease incidence of 25% yielded only 67.4 nuts. This has

demonstrated the superiority of D x T and T x D hybrids, over the Tall parent even in the disease endemic areas.

3. Another experiment conducted again in cultivators' gardens of 'hot spots' has shown that the disease incidence in COD x WCT hybrid at the fifth year of planting was 5.1% as compared to 16.4% disease incidence in MYD x WCT hybrid. This has indicated that there is a delay in contracting the disease in these D x T hybrids in the initial years of planting, which has resulted in flowering of nearly 70% of the progenies before they got infected. This positive character in COD x WCT hybrids will help in managing the disease and ensure a reasonably good yield up to ten years from flowering.

4. Underplanting is not necessarily required for the test seedlings to get exposed to the MLO inoculum; instead, planting in a clear plot, where palms all around the border are heavily diseased, provides sufficient epiphytotic conditions.

5. The impact of the disease on yield and yield contributing characters, has been studied. There was a gradual reduction in yield of nuts from healthy (36) to disease early (34), disease middle (30) and disease advanced (16) palms. The yield reduction in disease advanced stage is too drastic making it uneconomical to retain such palms. The viability and germination of pollen grains were also affected by the disease, particularly in disease-advanced stage, coupled with inflorescence necrosis leading to cent percent pollen sterility.

6. Identifying disease-free elite palms yielding over 200 nuts/palm/year with high copra content per nut and utilizing them in the breeding programme for

resistance/tolerance to root(wilt) disease, has great potential in managing or controlling the disease. A total of 12 such elite palms already identified in disease endemic areas of southern Kerala, were monitored for their yield, yield contributing characters and reaction to RWD. They have maintained their high yield level of over 200 nuts/palm/year, with the maximum of 471 nuts in Thazhava palm, for a period of 9 years from the date of their identification (1977-86). Subsequently, there was a general decline in yield from the 200 nuts mark, when five of them succumbed to the disease during 1987-88. However, all of them maintained a reasonably good yield (96-156 nuts) which is comparable to that of T x D and D x T hybrids in disease-free, rain-fed gardens.

7. Root(wilt) disease-free, high-yielding palms have been found growing in limited numbers among the heavily diseased palms, in the disease endemic areas. Survey of natural population of Chowghat Green Dwarf palms in 'hot spots' has shown that the CGD is comparatively resistant/tolerant to root(wilt) disease, and only 21% of the palms were found to be affected by the disease in contrast to 85--90% of the surrounding WCT palms. The open-pollinated progenies of CGD also showed a disease incidence of only 16% at 7<sup>th</sup> year after planting, whereas, CGD x WCT hybrid progenies raised in a disease-free area have contracted the disease to the extent of 60% in the 5<sup>th</sup> year after planting.

8. Introduced cultivars and the intervarietal hybrids raised in disease-free areas may not possess any natural resistance/tolerance to root(wilt) disease as evident from the data collected from these screening experiments. Hence, sources of natural resistance should be sought in populations growing in 'hot spots' since

decades.

A total of 21 WCT and five CGD disease-free and high-yielding palms were identified and utilized in the breeding project for evolving RWD resistant/tolerant genotypes.

9. Hybridization involving disease-free and high-yielding WCT and CGD palms in 'hot spots' has been carried out in the following cross combinations with a view to generating progenies for screening against root(wilt) disease.

1. WCT x WCT - **Biparental (*inter-se*)**
2. WCT x WCT - **Mixed pollen (top cross)**
3. WCT - **Selfed**
4. WCT x CGD - **T x D**
5. CGD x WCT - **D x T**
6. CGD - **Selfed**

A total of 648 artificially pollinated progenies of 57 cross combinations, and 198 of OP progenies were under-planted among diseased palms in 'hot spots' during 1991-1994 and their reaction to root(wilt) disease studied.

Out of 226 progenies of WCT planted during 1992, the percentage of disease incidence was only 4.4%, in 30 months after planting, as against 20% in the control (WCT-OP). This has clearly demonstrated that progenies raised from the disease-free palms by controlled artificial pollination have a better chance of possessing resistance than their open-pollinated progenies.

10. Disease-free palms identified in 'hot spots' exhibited a high rate of leaf and inflorescence production and high setting percentage. The high copra content per nut in these palms could be exploited for evolving disease resistant and high yielding genotypes with high copra content per nut for disease endemic areas.

11. The CGD with its early flowering trait combined with its inherent resistance/tolerance to RWD constitutes an ideal parent for producing D x T hybrids for 'hot spots'.

Among the 31 CGD x WCT hybrid progenies planted in 1991 at C.P.C.R.I. (RS) Kayangulam, none of them has shown the symptoms of the disease at the fifth year of planting and the first flowering was noticed in 30 months. The average yield per palm has been estimated as over 100 nuts based on the estimate made in the fifth year of planting. They have also recorded a high copra content of 215 g/nut.

12. Because of the prolonged, juvenile pre-bearing period in Tall palms (five to seven years) as compared to the dwarf (two and a half to four years), the T x D and the selfed progenies of WCT when planted in disease endemic areas, are subjected to the disease stress prior to flowering for a longer period than the dwarf or the D x T progenies. Hence, the chance of getting the disease in the pre-bearing stage, is more in Tall and its derivatives. This has been reflected in the results obtained from the trials laid out under this investigation. Since the flowering will be affected adversely if the seedlings contract the disease before flowering, the CGD x WCT hybrids are a potential source for tackling the disease in view of its early bearing

tendency and high yield potential. Under good management, 70% of the progenies could be made to flower in (40-50) months and once they have flowered and started yielding, a good yield can be obtained atleast for a period of 10 - 15 years after flowering even in the event of their subsequently contracting the disease to the extent of 50% as evidenced from earlier data on COD x WCT hybrids. A mean yield of 100 nuts or more /palm/year for ten years is a fairly economic return at the existing market rates. In the event of these progenies getting diseased, 10 - 15 years after flowering, uprooting and replanting with fresh CGD x WCT hybrids would be a profitable proposition. On the other hand, if the initial trend of low disease incidence and high yield in CGD x WCT is found to be consistent and steady even at a moderate level of 60% resistance/tolerance with a mean yield of 80 nuts/palm/year, this will revolutionize the entire coconut cultivation in the eight root(wilt) affected southern districts of Kerala.