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SEARCH FOR ROOT (WILT) DISEASE RESISTANCE IN COCONUT

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The root (Wilt) disease, a complex malady of coconut, has affected nearly one third of the seven lakh hectares of the crop in the State of Kerala. The disease which was detected a century ago in isolated pockets of central Kerala is spreading fast in all directions causing an annual loss of 34 crores of nuts. Studies so far conducted on the cause of root (wilt) disease presents a complex situation wherein more than one biological agents are involved. As such no specific measures for the control of the disease have been evolved.

Breeding for resistance is one of the very important measures adopted for combating diseases. Control of diseases by use of a disease resistant variety has been described as the "Painless method" that does not levy on the farmer's pocket. Plant species are sufficiently plastic that man has been able to mould numerous varieties of plants to oppose specific diseases.

We might consider in this connection some of the terms commonly used in breeding for disease resistance which will help in avoiding some wrong ideas about the nature of resistance in plants. The terms "disease resistance" and "Immunity" can be used to denote the different degrees of the same thing. Immunity means complete resistance to a disease and those plants which are immune to a particular disease are not subjected to attack by the pathogenic organism that censes the disease.

Resistance is the ability of a plant to withstand, oppose, lessen, or even overcome the attack of a pathogen. "Susceptibility" is the inability of a plant to defend itself against an organism. Immunity is absolute, but resistance or susceptibility are relative. A plant is either immune or not immune to a parasite organism. Another one may be "slightly susceptible" or "moderately resistant" or "extremely susceptible" but not moderately immune or highly immune. Susceptible plants often avoid infection by mere "escape". "Tolerance" is the ability of a plant to endure the invasion without showing many symptoms or much damage which is also termed as "Practical resistance".

We must also remember that the different degrees of disease resistance displayed by plants are not absolute and fixed. Environmental and other factors like temperature, fertility reactions of the soil, the degree of virulence of the pathogen, the age and condition of the plant etc. may modify them profoundly.

Search for disease resistance was started as early as 1870 by Prof. Foex of France when the grape culture in Europe was threatened by powdery mildew disease for which a resistant variety was successfully evolved. Control of "sugarcane mosaic", a virus disease, transmitted by a vector *Aphis maidis* by breeding a resistant variety was an epoch making work in resistance breeding. The sugarcane mosaic that caused the complex decline of sugarcane production in the sub-tropical cane-growing western hemisphere caused a lot of public concern. A resistant variety of sugarcane was evolved by hybridization between *Saccharum spontaneum* (a Java variety) and *S. officinarum*, the noble Indian cane. Development of U.S. 15, sugar beet variety resistant to "curly top virus", Sea Island Cotton variety resistant to Fusarium wilt etc. are landmarks in the search for disease resistance.

The results obtained in Jamaica in its attempts to solve the knotty problem of lethal yellowing affecting the indigenous Jamaica Tall coconut palms encourage us in our hope of finding out a solution for the dreaded root (wilt) disease of Kerala. The "Malayan Dwarf" variety of coconut has been established to be resistant, if not immune, to the devastating lethal yellowing disease of unknown etiology. The work on the search for root (wilt) resistant varieties of coconut was not given adequate importance in India until 1960 when systematic work on these lines was started at Kayamkulam, Kerala, with West Coast Tall and indigenous dwarf palms. Even though no resistant material has been encountered so far in those trials it has been proved that progenies of healthy parents from a disease free area are less susceptible to the disease.

With the object of finding out a variety resistant or tolerant to the root (wilt) disease a series of screening trials comprising diversified genetic materials were started from 1971 onwards at the Coconut Research Station at Kumarakom which is located in an area where the coconut is severely affected by root (wilt) disease. The materials for the trials were obtained through introduction and hybridization. One year old progenies of different paired cross combinations and indigenous and exotic varieties were underplanted in replicated trials at different periods with West Coast Tall as standard check. A list of hybrids/varieties thus planted for screening trials is given in Table 1. The list is made comprehensive so that wider attention is received by the researcher as well as the cultivator.

Preliminary observations recorded from 1971 planting (Table 1) indicated that within a period of five years all the hybrids/varieties tested become infected by the disease. Further, there are indications of tolerance by the variety Laccadive Dwarf which recorded the lowest disease intensity (Maximum Disease Index =5.8) while West Coast Tall and Tall × Dwarf showed an intensity (D.I.) of 52.0 and 67.6 respectively. The Laccadive Dwarf and its hybrid progenies are subjected to further investigation.

The test palms planted during 1974 onwards are left for the natural incidence of root (wilt) disease and it is too early to get any result from these palms. It is expected of those who carry the baton of the coconut breeding relay to fill the existing lacunae and to meet the challanges posed by the root (wilt) disease.

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TABLE 1

List of Coconut hybrids/varieties put under screening trials for root (wilt) disease resistance

Inter-varietal hybrids

1.	Tall × Dwarf	(1971)*
2.	,, × Gangabondam	(,,)
3.	,, × Yellow Dwarf	(,,)
4.	,, × Nyior Gading	(,,)
5.	,, × Strait Settlements	(,,)
6.	,, × Laccadive Dwarf	(,,)
7.	,, × Andaman Dwarf	(,,)
8.	,, × Tall	(,,)
9.	Laccadive Ordinary × Laccadive Ordinary	(,,)
10.	New Guinea × New Guinea	(,,)
11.	Andaman Ordinary × Andaman Ordinary	(,,)
12.	Laccadive Small × Laccadive Small	(,,)
13.	Java × Java	(,,)
14.	Philippine × Philippine	(,,)
15.	Strait Settlements × Strait Settlements	(,,)
16.	Andaman Giant × Andaman Giant	(,,)
17.	Fiji × Fiji	(,,)
18.	Bengal × Bengal	(,,)
19.	,, × Gangabondam	(,,)
20.	,, × Laccadive Dwarf	(,,)
21.	Green Dwarf × Thembili	(,,)
22.	,, × Strait Settlements	(,,)
23.	Dwarf × Tall (NCD)	(1972)
24.	San Ramon × Laccadive Micro	(1974)
25.	Laccadive Micro × San Ramon	(,,)
26.	Andaman Dwarf × Yellow Dwarf	(,,)
27.	,, × Tall	(,,)
28.	Nyior Gading × Tall	(,,)
29.	Laccadive Ordinary × Gangabondam × Yellow Dwarf	(,,)
30.	Laccadive Ordinary × Gangabondam × Spicata	(,,)
31.	Fiji × Gangabondam × Spicata	(,,)
32.	Laccadive Ordinary × Gangabondam × New Guinea	(,,)
33.	Gangabondam × Tall	(,,)
34.	Tall × Green Dwarf	(,,)
35.	Fiji × Yellow Dwarf	(,,)
36.	Yellow Dwarf × Tall	(,,)
37.	Andaman Ordinary × Laccadive Dwarf	(,,)
38.	Laccadive Ordinary × ,,	(,,)
39.	Philippine × ,,	(,,)
40.	Java × ,,	(,,)
41.	New Guinea × ,,	(,,)
42.	Laccadive Dwarf × Tall	(,,)
43.	Laccadive Ordinary × Gangabondam × Laccadive Dwarf	(,,)
44.	,, × Nyior Gading	(,,)
45.	Laccadive Ordinary × Gangabondam	(1974)
46.	,, × Green Dwarf	(,,)
47.	,, × Andaman Ordinary	(,,)
48.	,, × Yellow Dwarf	(,,)
49.	Andaman Ordinary × Nyior Gading	(,,)
50.	,, × Gangabondam	(,,)
51.	,, × Andaman Dwarf	(,,)
52.	,, × Yellow Dwarf	(,,)
53.	,, × Green Dwarf	(,,)
54.	New Guinea × Gangabondam	(,,)
55.	,, × Andaman Dwarf	(,,)
56.	,, × Green Dwarf	(,,)
57.	,, × Nyior Gading	(,,)
58.	,, × Yellow Dwarf	(,,)
59.	Cochin China × Yellow Dwarf	(,,)
60.	,, × Cochin China	(,,)
61.	,, × Gangabondam	(,,)
62.	,, × Nyior Gading	(,,)
63.	,, × Andaman Ordinary	(,,)
64.	,, × Green Dwarf	(,,)
65.	Philippine × Yellow Dwarf	(,,)
66.	,, × Andaman Dwarf	(,,)
67.	,, × Green Dwarf	(,,)
68.	,, × Nyior Gading	(,,)
69.	,, × Gangabondam	(,,)
70.	Dwarf Orange × Tall Green	(1977)
71.	Dwarf Green × Tall Green	(,,)
72.	Chowghat Dwarf Green × Kulasekharam Dwarf Green	(,,)
73.	Chowghat Dwarf Orange × Kulasekharam Dwarf Orange	(,,)
74.	Chowghat Dwarf Orange × Gangabondam	(,,)
75.	Kulasekharam Dwarf Green × Gangabondam	(,,)

Introduced Varieties

76.	Laccadive Dwarf	(1971)
77.	Strait Settlements Green	(1972 & 1977)
78.	Malayan Dwarf	(1972)
79.	Java	(1972 & 1977)
80.	Cochin China	(1972)
81.	Andaman Giant	(1972 & 1977)
82.	Andaman Ordinary	(1972)
83.	San Ramon	(1977)
84.	St. Vincent	(,,)
85.	Jamaica	(,,)
86.	Keniya	(,,)
87.	Guam	(,,)
88.	F.M.S.	(,,)
89.	Fiji	(,,)

*Corresponds to date of planting.