

DEVELOPMENT AND PERFORMANCE OF BASAL STEM ROT (*GANODERMA*) DISEASE RESISTANT COCONUT GENOTYPE IN ENDEMIC AREA

By

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ABSTRACT

A Tall x Tall coconut genotype resistant to basal stem rot (*Ganoderma*) disease has been developed for the first time in India. The resistant coconut genotype registered higher survival rate, growth characters and nut yield in disease endemic area. It contains more amount of phenolics, lignin, amino nitrogen and lesser amount of sugars which may be the factors responsible for the disease resistance.

INTRODUCTION

Coconut is an important oilseed as well as plantation crop in India. Basal Stem Rot (BSR) or *Ganoderma* wilt of coconut caused by *Ganoderma lucidum* is a lethal disease affecting coconut production in Tamil Nadu and other major coconut growing states in the country. Integrated disease management practices including cultural, chemical, and, biological methods have been developed at Coconut Research Station, Veppankulam (Bhaskaran *et al.*, 1989, 1994). All these management practices do not offer complete control of the disease. They are useful to reduce the disease intensity and to prolong the life span of diseased coconut palms for a few more years. Hence, developing a disease resistant coconut genotype is highly essential to manage the disease and to increase the coconut production.

MATERIALS AND METHODS

In a coconut garden in BSR disease endemic area with 978 East Coast Tall (ECT) coconut palms, heavy incidence of BSR (46%) was observed. The disease was in continuous patches and in this affected area, a total of 20 trees were found to be completely free from BSR. These identified trees have not picked up infection. These trees were used as pollen parent and they were crossed with susceptible ECT palms. Seedlings of this cross combination were screened along with other nine coconut genotypes in disease endemic area at Thambikkottai village of Tamil Nadu. The experiment was initiated during August 1989. Observations on survival, disease incidence and growth parameters were recorded in ten years after planting. Nut yield in ten coconut genotypes (6 varieties and 4 hybrids) were recorded during the period 1995-1999 (4 years). The chemodiagnostic method Ethylene Diamine Tetra Acetic Acid (EDTA) test was found to be a useful tool for the early detection of *Ganoderma* infection in coconut palms before the appearance of visual disease symptoms (Kamala Thirumalaisamy *et al.*, 1991; Karthikeyan, 1995). This test was employed with different coconut genotypes for early detection of the disease in this experiment. In EDTA test, one gram of root tissue is immersed in 10 ml of 0.3 M EDTA disodium salt for one hour and filtered through Whatman No. 3 filter paper. The optical density value of the filtrate is measured at 400 nm. To find out the mechanism of resistance, certain biochemical constituents *viz.*, phenolics, carbohydrates, lignin and amino nitrogen were estimated.

RESULTS AND DISCUSSION

The results indicated that the coconut genotype ECT x BSR tolerant ECT (Tall x Tall) registered a higher rate of survival (66.7%) in BSR sick soil ten years after planting as compared to 6.7 – 40% survival in other coconut genotypes.

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This BSR tolerant hybrid also produced more number of functional leaves (40) when compared to 37 functional leaves in the ruling variety East Coast Tall. The coconut hybrid COD x WCT recorded a higher mean annual nut yield of 130 nuts/palm followed by ECT x BSR tolerant ECT with 129 nuts/palm as compared to 93 nuts in ECT. It was found that the coconut genotype ECT x BSR tolerant ECT is resistant to basal stem rot disease of coconut in sick soil in the disease endemic area by exhibiting a good performance in survival, growth characters and nut yield.

ECT x BSR tolerant ECT recorded a mean O.D. value of 0.12 lesser than the critical level (0.20) in EDTA test as compared to the O.D. values of 0.23 to 0.42 in other genotypes. It indicates that the hybrid ECT x BSR tolerant ECT has not picked up the infection and is resistant to the disease. Generally, susceptible coconut palms of five years old and above are exhibiting visual disease symptoms and /or recording positive disease reaction in early diagnostic test due to root rotting. But this disease resistant coconut genotype has not shown any visual disease symptoms or positive disease reaction even at the age of 10 years.

The data (Table 2) on the biochemical constituents of coconut genotypes revealed that ECT x BSR tolerant ECT contained more quantity of total phenols and ortho-dihydroxy phenols than the susceptible genotypes. High tissue phenol level with disease resistance have been correlated in coconut against leaf blight disease caused by *Pestalotiosis palmarum* (Karthikeyan and Bhaskaran, 1997). The resistant coconut genotype had lesser quantity of reducing, non reducing and total sugars. Sugars are the precursors for the synthesis of phenolics, phytoalexins, lignin and callose and they play an important role in defense mechanism of plants.

Lignins are the most abundant and widely distributed phenolic polymers found in plants. In the present study, the resistant genotype had more amount of lignin than the older ones. Lignin may act as a physical barrier to infection by the pathogen. Lignification occurs at the site of fungal penetration and this barrier is resistant to cellulolytic and macerating enzymes of the pathogens. Similar results were reported in coconut leaves having resistance against leaf blight infection (Karthikeyan, 1996). Higher amount of amino nitrogen (0.70 mg) was recorded in resistant coconut genotype when compared to the susceptible ones (0.27-0.44 mg). It is concluded that higher level of total phenols, O.D. Phenols, lignin and amino nitrogen contents in ECT x BSR tolerant ECT coconut genotype may be responsible for the resistance against basal stem rot disease.

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Table 1 Performance of coconut genotypes in BSR sick soil

Genotype	No. of seedlings planted	Number Surviving	Percent survival	No-of Palms infected	Functional Leaves/tree	Mean nut yield/ Palm/year (1995-99)
San Ramon	15	5	33.3	2	30	
Lakshadweep Ordinary	15	1	6.7	-	23	65
British Solomon Islands	15	1	8.3	-	35	109
Java Giant	15	4	26.7	-	36	83
Straight Settlement Green	15	7	46.7	3	33	71
WCT x COD	15	6	40.0	3	28	90
COD x WCT	15	4	26.7	-	33	130
VHC.1 (ECT x MGD)	10	1	10.0	-	38	89
East Coast Tall (ECT)	10	4	40.0	-	40	93
ECT x BSR tolerant ECT	18	12	66.7	-	42	129

Table 2 Optical density values in EDTA test and biochemical constituents of coconut genotypes

Genotype	Bio chemical constituents (mg/g)*							
	O.D. in EDTA test (mean)	Total phenols	O.D phenols	Reducing sugars	Non reducing sugars	Total sugars	Amino nitrogen	Lignin
San Ramon	0.35	14.0	8.2	16.4	5.9	22.3	0.42	4.0
Lakshadweep Ordinary	0.32	12.7	7.6	14.8	6.4	21.2	0.28	2.2
British Solomon Islands	0.42	13.4	7.6	14.8	6.2	21.0	0.35	3.0
Java Giant	0.31	13.4	7.7	15.3	5.9	21.2	0.30	3.1
Straight Settlement Green	0.27	12.6	6.8	16.6	7.0	23.6	0.27	2.9
WCT x COD	0.32	11.4	6.8	14.9	7.2	22.1	0.44	4.0
COD x WCT	0.32	11.9	6.2	15.3	6.7	22.0	0.33	3.5
VHC.1 (ECT x MGD)	0.23	12.6	7.1	16.0	5.8	21.8	0.30	2.0
East Coast Tall (ECT)	0.29	14.8	8.5	14.2	5.2	19.4	0.36	4.5
ECT x BSR tolerant ECT	0.12	16.7	9.7	13.0	4.6	17.6	0.70	5.3

* Mean Values