

## Breeding for resistance / tolerance to coconut root (wilt) disease

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The Coconut Root (wilt) disease reported over a century ago in Kerala is continuously prevalent in 8 southern districts from Trichur to Trivandrum. The survey conducted during 1984 indicated that the disease is prevalent in about 0.41 million ha. causing an annual loss of 968 million nuts. Evidence for the involvement of MLO in the etiology of root (wilt) disease has been established as a result of research carried out at CPCRI regional station Kayangulam in the early 80's. As the disease cannot be controlled by conventional plant protection measures, development of resistant/tolerant varieties is the only practical solution to the disease.

Earlier field trials conducted to develop the disease tolerant varieties showed that none of the available 66 varieties and 30 hybrids have the desired level of resistance to root (wilt) disease.

A comprehensive breeding programme for evolving root (wilt) resistant/tolerant varieties was initiated and has been implemented since 1987. It was observed that in the disease endemic areas (hot spots) of Kottayam, Allepey, Pathanamthitta and Quilon districts, in the midst of the highly disease affected palms, disease free high yielding palms were found. Those disease free palms which are over 35 years old and high yielding (80 nuts or more per year) were identified as the base material for the breeding programme. Survey in the disease endemic areas also indicated that Chowghat Green Dwarf palms are comparatively disease free.

A crossing programme has been launched involving disease tolerant high yielding WCT and disease free Chowghat Dwarf green palms and the following combination of crosses were made starting from 1987.

- A. West Coast Tall (WCT)
  1. WCT x WCT (inter-se)
  2. WCT - Selfing
  3. WCT x CDG
- B. Chowghat Green Dwarf (CDG)
  1. CDG x WCT
  2. CDG - Selfing

So far 1083 seedlings raised from the crosses involving 121 WCT and 19 CDG palms have been planted for screening against root (wilt) disease at the experimental farm of CPCRI regional station Kayangulam. The first field planted progenies (1991) have started flowering and none of the seedlings planted since 1991, from this breeding programme have taken up the disease. This clearly indicates that the breeding programme envisaged is progressing in the right direction and the Institute will be able to release disease tolerant/resistant

variety in the near future and thereby solve the root (wilt) problem on a permanent footing.

As an interim measure the Scientists of CPCRI conducted a survey in other disease endemic districts in association with the Coconut Development Board (CDB) to find high yielding disease-free palms. The CDB has launched a programme to collect seed nuts from the disease-free palms for raising seedlings and distributing them to the coconut growers in 8 southern districts of Kerala.

Other recent achievements of the Institute are studies on the safe storage of copra and coconut oil. The main objectives of the studies were to determine Equilibrium Moisture Content, and to find out proper storage structures for copra and coconut oil to improve the shelf-life of the products. The results revealed that copra can safely be stored during the rainy season by keeping it in an atmosphere saturated with either biogas (for three days), neem leaf gas or sulphur dioxide. To improve the shelf-life of coconut oil, it can be treated with either citric acid (500 ppm), tamarind (2%), common salt (1%) or sodium metabisulphite (5000 ppm) and stored in litre tin boxes or poly bags.

Experiments were conducted on the use of sex pheromones to trap coconut red palm weevils which revealed that the male-produced aggregation pheromone of the Asian Palm Weevil, *Rhynchophorus ferruginae* received from Simon Fraser University, Burnaby, is very effective and far superior to other proven treatments in attracting both the sexes of red palm weevils. It was observed that once the pheromone lure is removed from the plastic bag for setting the trap, the release of pheromone will last for three months.

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## Brief report on oil palm bud rot meeting

Montpellier, 19-20 January 1995

In answer to a request from the Common Fund and the FAO, a meeting was held in Montpellier on 19-20 January to discuss the research programme on oil palm bud rot. It was attended by representatives from research institutes in Brasil and Colombia and representatives from oil Latin American oil palm plantations, researchers from CIRAD-CP and an observer from NRI.

During the first day of the meeting information was exchanged on the situation of the disease in different countries of Latin America and on the state of research. The report of the first day is the following:

1. The economic impact is increasingly obvious. It can easily be demonstrated that the most suitable regions for oil palm are being progressively eliminated and this is a threat to potential investors.

11-30 years after the first reported observations in North Colombia and after 15 years of research:

### 1. Symptomatology :

Lethal diseases leading to rapid death of oil palm usually recognised in mature palms were reported in almost all major oil palm regions. Although there is some variation in symptoms, in most cases the major facts are decay of the spear accompanied by a bud rot with some further yellowing usually from the youngest leaves. This is not associated with any other pests commonly identified on oil palm in the region (including nematodes, trypanosomes, fusariosis ...)

Some exceptions could be identified where the disease is not lethal but where the plants are debilitated (Ilanos orientales). A lot of observations suggest that differences in symptomatology could be due to environmental factors but no definitive conclusion could be drawn.

### 2. Epidemiology :

Although many factors seem to influence the evolution of the disease (rainfall, water table, soil type, temperature ...) the most consistent relationships are associated with the highest incidence from the forest margin (Ecuador) and prevalent wind direction (Brazil) in the early stage of an outbreak of the disease. Once the disease is established it seems to follow an epidemic spread.

Several people have seen a positive relationship between rainfall and the incidence of the disease, but it is not clear whether it is a causal or associative relationship between the two.

### 3. Etiology :

All groups of possible pathogen groups have been tested with negative or inconclusive results :

- Many potential pathogens have been isolated, but some have consistently been associated with the disease and symptoms of the disease have not been reproduced with these agents (including fungi, bacteria, nematodes, ...)

Furthermore, treatments with fungicides, including rodomyal, aliette, vitawax, antibiotics and insecticides (tetracyclines, streptomycine ...) do not show any prophylactic or curative effects. Some of the trials are still under way for *Fusarium* and *Phytophthora*.

- Extensive preliminary studies on virus and virus like organisms have again failed to produce consistent results with the exception of the discovery of a greater amount of 2 stranded RNA in diseased palms compared with healthy palms.

- Mechanical transmission has been attempted without apparent success, from palm to palm to classical virus indicators.

### 4. Vector hypothesis :

Spread of the disease suggests an airborne vector. Thousands of species have been tested without any conclusive results.

### III. Resistance

The most positive and consistent observation is the high tolerance or very low susceptibility of F1 hybrids between E.o. and E.g. regardless of the source of the germplasm or the region of the testing. Genetic improvement appears to be the most promising way to overcome the problem.

At present, the oil productivity of the F1 hybrids is too low for an immediate large scale commercial exploitation except if producers agree to accept a 50% of total oil yield, compared to current oil palm, instead of losing everything.

Two strategies are proposed to improve this material:

- the exploitation of F<sub>1</sub> by seeds and vegetative propagation which requires a rather high investment in laboratories and field testing
- the backcross strategy which will be more feasible when an early resistance screening test is available.

### IV. Conclusion

The general conclusion is that we now need to focus on the few positive observations available;

- genetic improvement;
- etiology area particularly the virus hypothesis, it is probable that an early screening test can be developed only when the etiology of the disease has been established;
- intensification and more studies of the epidemiological observations.

On the second day of the meeting the participants worked on the programme which they will present to the Intergovernmental Group on Oils and Fats of the FAO for submission to the Common Fund for funding.

The overall project will be managed by CENIPALMA, Colombia.