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Resistance or susceptibility, age of bearing and yield in young coconut palms in relation to development of root (wilt) disease

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ABSTRACT

The probable presence of a heritable resistant factor against the root (wilt) disease in the healthy coconut palms (*Cocos nucifera* L.) occurring frequently among diseased palms was studied. Observations recorded from the progenies of crosses between such healthy palms raised in diseased tract revealed that possibly no resistant factor was present in them. Further observations indicated that (*i*) young coconut palms of 'West Coast Tall' variety are more susceptible to disease at the age of bearing, (*ii*) in the palms which contracted the disease before the commencement of bearing, the bearing age was often delayed indefinitely, and (*iii*) in the young palms that became diseased before the commencement of bearing, the yield was drastically affected when compared with the yield of those that were diseased after the commencement of bearing.

The etiology of the root (wilt) disease of coconut palm (*Cocos nucifera* L.) has been the subject of intensive studies in the recent past (Nagaraj and Menon, 1956; Shanta and Menon, 1960; Summanwar *et al.*, 1969; Srivastava *et al.*, 1969). Although pathogenic factors have been attributed as the cause of the disease in these studies, the exact etiology of the disease is still not known. However, an observation of interest has been the occurrence of healthy palms growing adjacent to diseased ones in the coconut gardens affected by the disease. A field experiment was conducted to study whether this is due to the presence of a heritable resistant factor. The results obtained from these studies are discussed in the present paper.

MATERIAL AND METHODS

A batch of 29 middle-aged healthy palms of 'West Coast Tall' variety growing intermingled with highly diseased palms at the farm of the Research Institute were selected for the study. In a block of the farm having high percentage of diseased trees, 216 seedlings raised from the different crosses between these healthy palms were under-planted. During the subsequent experimenal period of 13 years, 52 of the young palms of this group were cut and removed because they were affected with other pests and diseases.

Observations on the onset and development of root (wilt) disease, age of commencement of bearing and the yield of nuts of the remaining 164 palms were recorded from the 7th year of planting up to the 13th year.

RESULTS AND DISCUSSION

Plants showing visible disease symptoms

Data relating to the percentage of palms that exhibited visible symptoms of the disease show that at the beginning of the experimental period 22·1 per cent of the palms had contracted the disease. The disease incidence did not increase appreciably for the next 2 years. However, a sharp increase was recorded thereafter, and 13 years after planting the disease incidence was 69·7 per cent (Fig. 1). Considering the individual groups of progenies belonging to different combinations of crosses separately, the disease incidence ranged from 63·2 per

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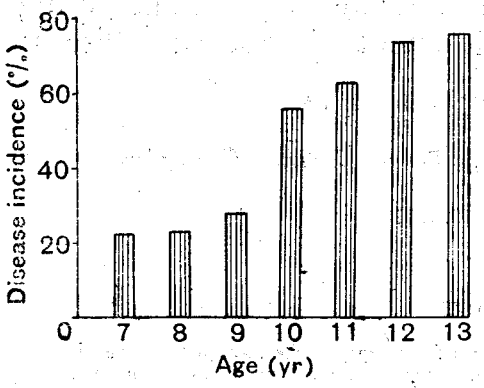

Fig. 1. Disease incidence (per cent) in coconut palms in relation to age.

cent to 100 per cent at this period. By this period, 60 per cent of the parent palms also contracted the disease. These results suggest that in 'West Coast Tall' there is apparently no resistant factor against the disease.

Relationship between the commencement of bearing and the susceptibility to disease

By the 10th year of planting, 61 per cent of palms of the total population had commenced bearing and 56·5 per cent of them had become diseased. By the 11th, 12th and 13th year, 70, 75 and 78 per cent of the palms, respectively, had commenced bearing, whereas 62·5, 68 and 69·7 per cent of them became diseased (Fig. 2). The close correlation between the period of bearing and susceptibility to disease was significant (the disease incidence, percentage of disease incidence and the age of bearing were statistically significant at 5 per cent level; r=0·994), suggesting that in this variety the age of commencement of bearing is the most vulnerable period.

Effect of disease on the age of bearing and yield of nuts

In 13-year-old palms, 29 of the 93 diseased ones had not commenced bearing, whereas only 2 of the 71 healthy palms did not commence bearing at this period. It was interesting to note that 26 of the 29 non-bearing diseased palms had contracted the disease before he 10th year of planting. Under normal conditions, 'West Coast Tall' commenced bearing between the 7th and 10th year of planting. The present observations thus suggest that if the young palms contract the disease before the age of bearing, the commencement of bearing is postponed indefinitely.

Yield of nuts

The yield of nuts of these palms had also been drastically affected by the disease. The average annual yield of those diseased palms that had commenced bearing ranged from 2 to 27 nuts per tree as

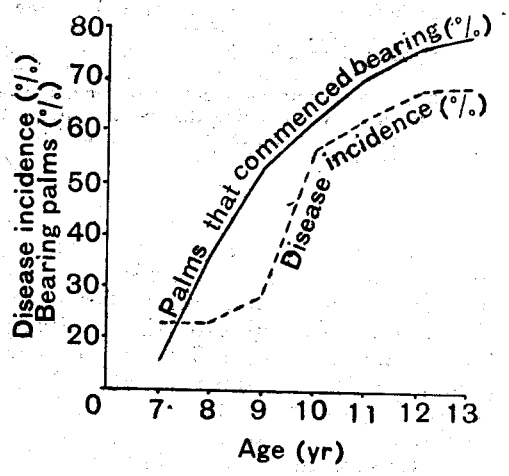

Fig. 2. Age and commencement of bearing in coconut palms in relation to the development of root (wilt) disease.

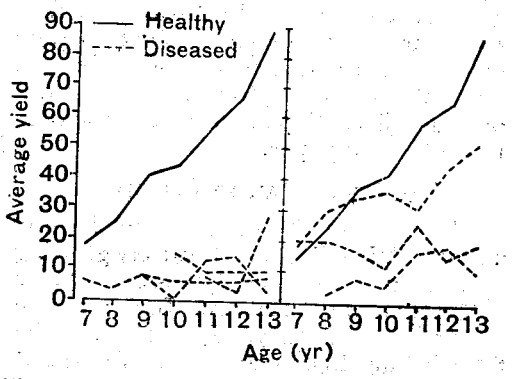

Fig. 3. *Left*, Annual yield of coconut palms diseased before the commencement of bearing; *right*, annual yield of coconut palms diseased after the commencement of bearing.

Table 1. Average annual yield of nuts in healthy and diseased young coconut palms

Age (Years)	Healthy	Diseased	Percentage of loss in the diseased plants
7	16·4	11·8	28·0
8	25·5	16·0	37·3
9	38·7	17·6	54·5
10	42·9	17·2	59·9
11	56·7	22·9	59·6
12	65·6	21·9	66·6
13	87·6	25·7	70·7

against 87·6 nuts per tree in the healthy group (Fig. 3, *left*). However, in about 40 per cent of the diseased palms the disease symptoms appeared only after the commencement of bearing, and the adverse effect of disease on the yield of nuts was less in this group. In this group of diseased palms, the loss in yield owing to disease became less as the trees reached steady trend in yield (Fig. 3, *right*).

The increase in the yield of nuts in the diseased palms was only over twice from the 7th year to the 13th year, whereas in the healthy palms it was over 5 times during the same period. In the healthy group, though the average annual increase in yield per palm during this period was about 12 nuts, it was only 2 nuts per palm in the diseased group (Table 1).

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