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Transmission of root (wilt) disease of coconuts

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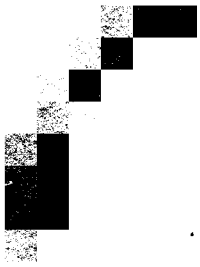

INTRODUCTION

A sap transmissible 'virus' was reported to be associated with root (wilt) disease, which is one of the important diseases affecting coconut palms in Kerala (Shanta and Menon, 1960). Poor nutrition, unfavourable soil conditions and association of *Rhizoctonia solani* with the rotting roots constitute important secondary factors affecting the intensity of disease (Menon, 1961).

Transmission trials by mechanical inoculation of healthy coconut palms in the field by leaf extract from diseased palms and by means of the insect *Stephanitis typicus* Dist., gave positive results (Nagaraj and Menon, 1956). The inoculation tests for transmission of disease were conducted in the field at the research station farm located in the heavily infected tract of Kerala and hence although indicative cannot be considered conclusive. The tests were, therefore, repeated on young healthy coconut seedlings grown in extra large cement pots inside the insect proof screen house.

EXPERIMENTAL

Twenty 2-year old healthy coconut seedlings of the west coast tall variety obtained from the Central Coconut Research Station, Kasaragod, were planted

in steam sterilised soil in 75 x 75 cm. cement concrete pots in 1959. The seedlings were watered with a balanced nutrient solution.

Crude extract was prepared from tender leaves of diseased coconut palms by freezing them overnight and then grinding them in twice the volume of 0.05 M phosphate buffer at pH 8.0. This extract was used for inoculation. Field experiments had shown that a high inoculum potential was needed to establish infection. In order to ensure good infection, the six seedlings under test were inoculated at bi-weekly intervals. Growth in potted seedlings was slow and only one leaf was produced every three months. Six pairs of leaflets starting from the base of the youngest fully open leaf of a seedling were inoculated. The leaflets were smeared with the extract using 200 mesh carborundum powder as abrasive. Five inoculations involving 30 pairs of leaflets were made on one leaf. Controls were inoculated with distilled water.

Six coconut seedlings were used for insect transmission tests with adults of *Stephanitis typicus* Dist. also. Insects were collected from the field and batches of 20 to 25 were used in each test. They were fed on diseased coconut leaves for 24 hours prior to their release on test seedlings. Insects in muslin bags were allowed to feed on coconut leaflets for 10 to 14 days. Inoculations were repeated after 2 weeks.

For soil transmission tests roots from diseased trees, washed and cut into small pieces, were incorporated in the soil of two seedlings in pots.

RESULTS AND DISCUSSION

The earliest symptom of the disease appeared on one of the 6 seedlings inoculated by the abrasion method 2½ years after the first inoculation. At the end of 3½ years 5 of the 6 seedlings showed some flaccidity of leaflets, stunting and paling of leaves (Fig. 1, Table I). Positive symptoms were obtained on cowpea indicator host with 4 of the 5 diseased seedlings both by mechanical means as well as through the agency of *S. typicus*.

One of the seedlings inoculated through the agency of *S. typicus* showed flaccidity of leaflets, stunting and paling of leaves 3½ years after the inoculations were started. Diagnostic symptoms were reproduced on cowpea when inoculated with leaf extracts from that seedling.

One of the 2 seedlings, in the soil of which diseased roots were incorporated also exhibited symptoms of the disease.

Measurements of length of leaves of the infected seedlings showed slightly stunted growth in two seedlings of the 'sap inoculated' series and in one seedling infected through *S. typicus* when compared to that of control.

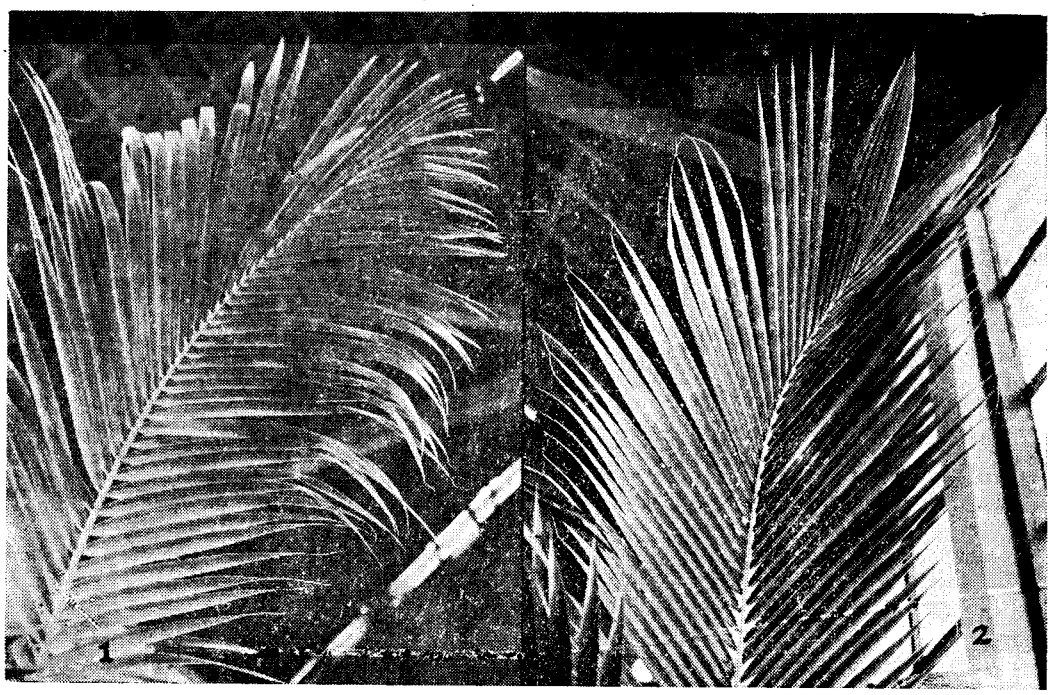

FIG. 1. *Leaf of:- 1. inoculated seedling showing flaccidity*
2. uninoculated control seedling

The soil at the base of the infected seedlings was found to be infective when tested 4½ years after the inoculations were started.

Exact field symptoms of the wilt disease were not reproduced in the infected seedlings in this experiment. Nevertheless, the primary symptoms of disease characterised by flaccidity of leaflets, paling and stunting of leaves were produced. Necrosis of leaves did not develop and the roots did not rot. The roots of infected seedlings have now been inoculated by *Rhizoctonia solani* which causes extensive root damage under field conditions. Whether the root rot is responsible for the development of necrosis of leaves will make an interesting study in this experiment.

It may be seen from the Table that 5 of the 6 seedlings inoculated by mechanical means got diseased while only one of the 'insect transmitted' seedling showed positive symptoms. Soil at the base of all the seedlings infected through mechanical inoculations had become infective whereas the soil of the single *S. typicus* infected seedling remained uninfective. The comparatively low percentage of transmission by *S. typicus* may be indicative of a not-so-effective vector for natural spread of the disease.

SUMMARY

Results of transmission trials conducted with coconut wilt 'virus' on seedlings of coconut grown in an insect proof screen house are reported. Primary symptoms of flaccidity. paling and slight stunting of younger leaves were observed on 5 of the 6 seedlings inoculated by rubbing, 2½ to 3½ years after inoculations were started.

One of the 6 seedlings inoculated by means of infective *S. typicus* got diseased and showed paling and stunting of leaves. One of the 2 seedlings inoculated through soil also developed the disease.

Soil at the base of some of the diseased seedlings became infective as evidenced by the cowpea test.

REFERENCES

Menon, K. P. V. (1961) — Unknown diseases of coconut with special reference to the root (wilt) disease of Kerala. *Proc. First Meeting of FAO Technical Working Party on Coconut Production, Protection and Processing.*

Nagaraj, A. N. and Menon, K. P. V. (1956) — Note on the aetiology of the wilt (root) disease of coconut palms in Travancore-Cochin. *Indian Coconut J.* **9**: 161-65.

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TABLE 1

Results of transmission trials on coconut conducted in the insect proof house. (Inoculations started in July, 1959)

Treatment	Seedling No.	Condition of seedling in 1960 June	1961 Jan.	1961 June	1962 Jan.	1962 June
Sap inoculation	1	H	H (d)	H (d)	DE	DE
	2	H	H	H	H	H (d)
	3	H (d)	H (d)	H (d)	DE	DE
	4	H	H (d)	H (d)	H (d)	DE
	5	H	H (d)	H (d)	DE	DE
	6	H	H (d)	DE	DE	DE
Insect transmission	1	H	H	H	H (d)	H (d)
	2	H	H	H (d)	H (d)	H (d)
	3	H	H	H	H (d)	H (d)
	4	H	H	DE	DE	DE
	5	H	H	H (d)	H (d)	DE
	6	H	H	H	H (d)	H (d)
Control	1	H	H	H	H	H
	2	H	H	H	H	H

H: Healthy. H (d): palms with doubtful symptoms of flaccidity or paling.
DE: early stage of disease.