

# Diseases of the Coconut Palm\*

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## III. RED RING

The third disease of coconut palms to be considered in this series is red ring, which has not been reported in the United States. It seems to be confined to the Western Tropics and has been recorded from Barbados, Brazil (Alagoas, Sergipe, and Bahia), British Guiana, British Honduras, Grenada, Honduras, Panama, St. Vincent, Tobago, Trinidad and Venezuela (1, 2). It was first described by Nowell (8) who derived its name from the very characteristic red ring that is present in the trunk of diseased palms. The external symptoms of this disease, unfortunately, are not easily separated from the external symptoms associated with other diseases. The etiology or cause of the disease was shown by Cobb (2) and since by others to be due to infection by the nematode *Aphelenchoides cocophilus* Cobb (1, 2, 4, 6, 8). According to Dr. B. G. Chitwood (formerly Chief Nematologist, State Plant Board, Florida; present address, Kaiser Foundation, California), the nematode should be called *Chitinoaphelenchus cocophilus* (Cobb) Mic. (Micoletzky 1922, *Arch. Naturg.* 87 J., Abt. A., 9 Heft pp. 584, 586, 587). Dr. Chitwood examined preserved males, females, and larvae from diseased coconut palms from Trinidad and suggested the renaming of the nematode based upon priority and the fact that the framework of the head is sclerotized (chitinized!). Such a head framework is not developed in any other members of the genera *Aphelenchus* and *Aphelenchoides* (3).

\*For previous articles in this series, see PRINCIPES 3:5-12, 49-52. 1959. Florida Agricultural Experiment Station Journal Series, No. 846.

The type host of the worm or nematode is the coconut palm (*Cocos nucifera* L.), but according to Filipjev and Stekhoven (5) the oil palm (*Elaeis guineensis* Jacq.) and Canary date palm (*Phoenix canariensis* Chab.) have also been reported as hosts.

In the coconut palm the disease is mainly a juvenile one, for very rarely do trees over ten years of age become infected (7). Trees less than four years of age are rarely affected, the highest incidences of infection occurring in trees four to seven years old (1). The onset of disease appears to be associated more with bearing than with absolute age (Fenwick, personal communication).

The first symptom of infection in a young tree is the conspicuous discoloration of the leaves. The lowest fronds start to turn yellow from the tip backwards. Figure 41, photograph taken in Trinidad, illustrates a young palm in the early stages of infection. The lower fronds are yellowish-bronze in color. At a more advanced stage the fronds may turn reddish-brown and tend to wilt. The leaves progressively turn yellowish-bronze and wilt until the entire crown has changed color. The heart leaves may or may not turn yellow. They may turn a greyish color and collapse at the base due to infection by secondary organisms. Here, as with lethal yellowing and bronze leaf wilt, the final stage of disease development is a rotting of the heart or bud. Infection by the nematode is fatal. If a palm shows symptoms of recovery, then it is probably not infected



41. Young coconut palm in Trinidad exhibiting symptoms of the red ring disease resulting from infection by the nema *Chitinoaphelenchus cocophilus*.

by the nema but most likely affected by bronze leaf wilt (1).

The symptoms illustrated in Figure 41 are not indicative or a reliable criterion of the red ring disease caused by infection with the nema *Chitinoaphelenchus cocophilus*. The external symptoms may be confused with those of several other diseases of the coconut palm. The most reliable symptom of the disease is the actual presence of a red ring, which occurs approximately 2 inches from the periphery in the trunk of an infected palm (Figure 42). The

ring is approximately 1 to 2 inches wide. The coloration, width, and position of the ring may vary, especially in the cases of older palms (Fenwick, personal communication). The palm illustrated in Figure 42 is actually a cross section of the same palm as shown in Figure 41. The presence of the red ring usually is indicative of infection by the nema. It is desirable that the diagnosis be confirmed by the actual presence of the nema, since reddening of palm tissue may occur from other causes, though the color usually does not occur

in a ring. There are no recorded cases of the red ring appearing without the nemas, nor, conversely, the nemas without the red ring.

In longitudinal section the red ring has its point of origin in the bole of the palm and extends upwards into the trunk.

Inoculation experiments have been conducted (2, 4, 6) with the nema at various entry points and infection has occurred. The palm weevil (*Rhynchophorus palmarum*) and ants have been implicated as disseminators of the nemas. Fenwick (4) proposed the following hypothesis to explain the distribution of the nema in the plant and the site of inoculation: "One is that infection starts in the bole and spreads upwards into the stem and downwards into the roots and the worms escaping into the soil; the other is the worms are present in the soil to start with, they penetrate the roots and work up into the bole and hence up the trunk." Fenwick points out that conclusive evidence does not support or condemn either theory but the available evidence supports the latter.

Trees older than ten years have been reported infected with the nema, but the symptoms produced by these trees were not identical with those of young trees. Fenwick (4) describes the external symptoms of such old trees as the leaves being brown, dead, and collapsed downward. The internal tissues of the trunk were high in moisture and corky. Very little discoloration occurred at the base. The typical red ring pattern was only visible just below the crown, where it was not so dark as that which occurs in young trees.

Fenwick (4) was able to recover nemas from all tissues except the flower stalk and fruit. He could find no evidence that nuts borne on old infected trees carried the nemas. However, nuts



42. Cross section of the coconut palm from Figure 41. Note ring which is red in color.

that have fallen and are considered by planters as suitable for seed may contain the nemas. Fenwick (4) found a few *Chitinoaphelenchus cocophilus*, along with several soil nemas, in the husks of such nuts. Thus the possibility that the organism may be disseminated in seed nuts should not be disregarded until positively eliminated.

The disease appears to be more prevalent in areas that are poorly drained.

Information on control measures unfortunately is not readily available. Briton-Jones (1) recommended isolation by trenches dug around the infected trees. The soil from such trenches should be thrown inwards towards the tree. The practicality of such a measure is doubtful and the operation of digging trenches expensive. If soil drainage plays a part, then it would be advisable to plant on well drained soil. This precaution would also help to control the bronze leaf wilt if it is caused by physiological drought. The use of soil fumigants and chemicals for control or



reduction of nematode populations or as barriers to their spread or the use of chemical injections to cure infected palms has not been adequately tested to merit recommendation. Growers should be cautious about the use of such chemical products as they may kill an otherwise healthy tree. Fenwick (4) reports several cases of product misrepresentation in Trinidad and Tobago. Another precaution for the palm grower is that he should not use seed nuts from infected areas as they may contain the nema *C. cocophilus*.

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#### Literature Cited

1. Briton-Jones, H. R. 1940. *The Dis-*

*eases of the Coconut Palm*. pp. 1-176. Bailliere, Tindall and Cox, London.

2. Cobb, N. A. 1919. A Newly Discovered Nematode, *Aphelenchus cocophilus* n. sp., Connected with a Serious Disease of the Coconut Palm. *West Indian Bulletin* 17: 203-210.
3. Chitwood, B. G. 1957. Personal communication.
4. Fenwick, D. W. 1957. Red Ring Disease of Coconuts in Trinidad and Tobago. *Colonial Office Report* pp. 1-55.
5. Filipjev, I. N. and J. H. Schuurmans-Stekhoven, Jr. 1941. *A Manual of Agricultural Helminthology* 878 pp. Fig. 1-460. E. J. Brill, Leiden.
6. Martyn, E. B. 1953. Red Ring Disease of Coconuts in Trinidad and Tobago. *Tropical Agriculture*. 30: 43-53.
7. Martyn, E. B. 1955. Diseases of Coconuts. *Tropical Agriculture*. 32: 162-169.
8. Nowell, W. 1919. The Red Ring or 'Root' Disease of Coconut Palms. *West Indian Bulletin*. 17: 189-202.

### THE EDITOR'S CORNER

David Barry has already provided us with an account of *Jubaeopsis caffra* with particular reference to its cultivation in California (*Principes* 2: 180-182. 1957). Dr. Walter Hodge has prevailed upon his friend Robert Story to prepare an account of this rare palm in its native habitat. Let Dr. Hodge introduce this new contributor.

"Robert Story is a scientist working as a survey officer in the Division of Botany (National Herbarium) in the Department of Agriculture of the Union of South Africa in Pretoria. In a recent letter he tells me that he is migrating to Australia within a few months . . . I met Robert Story while working in South Africa in 1951. He is a chap about my age and during the time that

I was in the Union he was one of the field officers in botany located with the Albany Museum at Grahamstown in the Eastern Cape Province. His daily work covered the whole area of the eastern Cape and, of course, this included Pondoland where the subject of [his] article is native. Story was born and brought up near Grahamstown on a farm where he first became associated with plants. I visited his home farm, still run by his elderly mother. She was a delightful person with a great love for plants and was the person who had stimulated him to get into botany.

"Besides Story's routine work as a field man and now a herbarium worker, his chief contribution to South African botany is the *Botanical Survey of*  
*Continued on Page 92*