

**Mycoplasmalike Bodies Associated
 with Lethal Yellowing Disease
 of Coconut Palms**

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ABSTRACT

Mycoplasmalike bodies were detected in phloem
 elements from inflorescences of lethal yellowing-diseased
 coconut palms. This finding suggests a mycoplasma
 etiology for lethal yellowing, and is the first report of
 mycoplasmalike bodies in diseased coconut palms.

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Lethal yellowing of coconut palms, observed in
 the Caribbean Islands after 1891 (3), accounted for
 the rapid death of 100,000 productive palms/annum
 in Jamaica alone in recent years. It devastated
 coconut plantations in Haiti, Cuba, Togo, Ghana, and
 Nigeria (8). An outbreak of the disease in 1955 in
 Key West, Fla., destroyed many palms there during
 the next 12 years before disappearing spontaneously.
 The cause of lethal yellowing has been variously
 attributed since 1905 to bacteria, salt damage,
 strontium or other toxic materials, nutritional
 deficiency, nematode injury, or a virus (1, 4, 8). This
 latter hypothesis was strengthened by reports of
 mechanical transmission of a filterable agent (12, 13).
 However, mechanical transmission has not been
 confirmed in Jamaica despite repeated attempts using
 the same and other techniques (4, 5). The present
 note reports the results of electron-microscopic
 examination of the earliest stage of the disease.

An 8-year-old coconut (*Cocos nucifera* L.) palm of
 the Jamaica Tall variety was felled at Darlingford
 near Manchioneal on the northeast coast of Jamaica
 near sea level. The tree, showing the earliest
 symptoms of lethal yellowing disease, still retained a
 proportion of its nuts and was without symptoms on
 the mature foliage. The young spear leaf appeared
 normal, but the next spear leaf, which was only
 partly expanded, had slight necrosis at the tips of a
 few pinnae. The inflorescence from which a sample
 was removed had just split along one side and, when
 opened, was about 50% necrotic at the distal end.

Samples were taken at the plantation within 0.5 hr of
 felling.

The rachilla material taken from just below the
 necrotic tip was prepared for electron-microscopic
 examination as described elsewhere (6). Bodies
 resembling mycoplasmas were found in sieve tube
 elements of the rachillae of the inflorescence taken
 from the tree showing early symptoms of disease.
 Ovoid, elongated, and filamentous forms were
 observed (Fig. 1-A). These pleomorphic bodies were
 bounded by a triple-layered structure comprising two
 electron-dense layers with a transparent layer
 between. This limiting unit membrane was ca. 10 nm
 thick. The internal structure of the bodies was
 indistinguishable from that described for other
 mycoplasmalike bodies associated with yellows-type
 diseases (10, 11). The central fibrillar material in the
 bodies was surrounded by a granular peripheral zone
 containing ribosomelike particles (Fig. 1-B). Some of
 the elongated bodies measured up to 2 μ in length.
 Filamentous forms were sometimes present as beaded
 chains. Mycoplasmalike bodies were also detected in
 sieve tube members from coconut palm leaves at later
 stages of the disease. They were less abundant in
 leaves than in the rachillae and, therefore, more
 difficult to locate. Mycoplasmalike bodies were not
 found in healthy coconut palms, nor were virus
 particles or microorganisms observed in the phloem,
 xylem, or parenchyma of diseased tissue.

The bodies associated with coconut lethal
 yellowing in the earliest symptoms of disease, but not
 associated with normal healthy plants, are similar in
 appearance to bodies found in other diseases of the
 yellows type (2, 11). The microorganisms have been
 provisionally described as mycoplasmalike bodies
 (MLB) (9), whose taxonomic status as well as the
 causal relationship to plant diseases is still enigmatic.
 Although temporary remission of several yellows-type
 diseases has been achieved by tetracycline
 chemotherapy, only in two instances was this linked
 with the disappearance of the microorganisms (7, 14).
 The finding of MLB in the phloem elements taken
 from the inflorescence of an infected palm, together
 with the absence of fungi, bacteria, or viruslike
 particles, suggests, but does not prove, that they may
 be the causative agents of lethal yellowing disease. In
 instances of animal and human diseases, the
 hypothesis of possible mycoplasma etiology, based
 solely on an association with mycoplasma, requires
 extreme caution, because mycoplasmas form part of
 the normal microbial flora of warmblooded animals.
 This is not so with plants, in which mycoplasma or
 mycoplasmalike bodies have never been observed in
 normal ones. Nevertheless, additional tests will be
 needed to establish whether the hypothesis of a
 mycoplasma etiology is correct. Supporting evidence
 will be hampered by the lack of proper cultivation
 methods for the presumptive plant mycoplasma
 agents, by the inability to graft coconut palms and
 so transmit the agent, by the lack of knowledge
 concerning the vector of the disease agent, and by the
 impracticality of chemotherapeutically treating a
 plant as large as a coconut palm to induce remission

of symptoms (7, 14). Unequivocal proof of the hypothesis that lethal yellowing is caused by a mycoplasma-like agent will, therefore, require a concentrated attack on several fronts.

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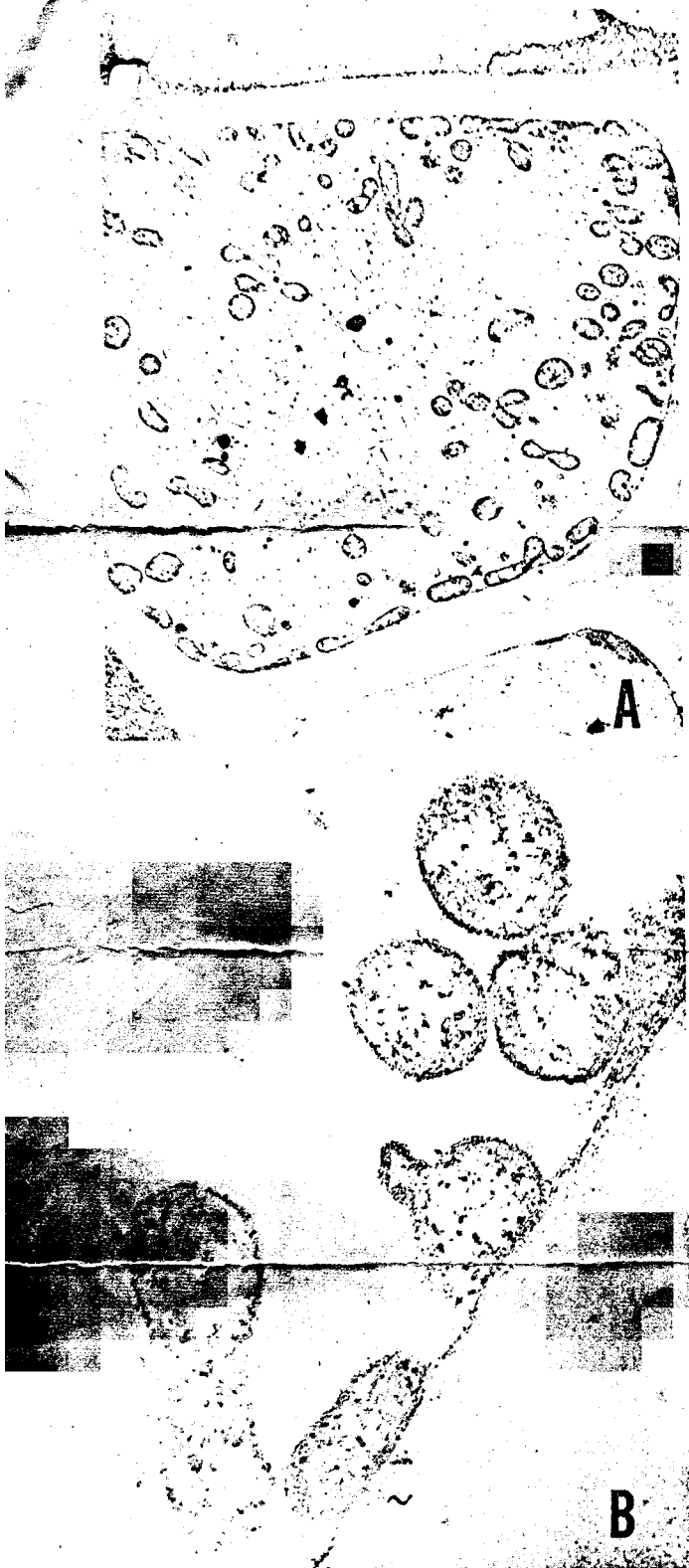


Fig. 1. A) Mycoplasma-like bodies (MLB) in the phloem elements from an inflorescence removed from a lethal yellowing diseased coconut palm. The ultrathin section is from rachilla material taken just below a necrotic tip (X 6,000). B) Note ribosomal-like particles and central fibrillar material of MLB (X 80,000).