

# Mycoplasmalike Bodies in Periwinkle: Their Cytology and Transmission by Pear Psylla from Pear Trees Affected with Pear Decline

G. H. Kaloostian, H. Hibino, and H. Schneider

Investigations Leader, Entomology Research Division, ARS, USDA, Riverside, California 92502; and Visiting Assistant Plant Pathologist and Plant Pathologist, respectively, Department of Plant Pathology, University of California, Riverside 92502.

Research accomplished while H. Hibino was on leave from the Institute for Plant Virus Research, Chiba, Japan, January 1969-June 1970.

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Accepted for publication 5 May 1971.

## ABSTRACT

In three experiments, mycoplasmalike bodies were transmitted from pear trees, *Pyrus communis*, with the symptoms of pear decline disease, to 40-50% of test periwinkle plants (*Vinca rosea*) by pear psylla (*Psylla pyricola*). All 12 control plants (exposed to pear psylla collected from disease-free trees) remained healthy. Mycoplasmalike bodies were present in the sieve tubes and phloem paren-

chyma cells of the two diseased plants examined, but were absent from plants fed on by pear psylla from healthy trees. These bodies were much like those found in plants infected with many yellows-type diseases: they had a unit membrane, ribosome-like particles, no vacuole, and a filamentous network. *Phytopathology* 61:1177-1179.

In 1967, Doi et al. (1) found mycoplasmalike organisms in plants infected with mulberry dwarf, potato witches'-broom, and Japanese aster yellows (1). Since then, these bodies have been found in many diseased plants heretofore presumed infected with plant viruses. Ploaie et al. (6) reported that mycoplasmalike bodies were present in periwinkle inoculated with Crimean yellows, European clover dwarf, stolbur, and parastolbur. Also, Maillet et al. (5) found mycoplasmalike agents in periwinkle plants inoculated with aster yellows, phyllody of clover, and stolbur of tomato. In 1970, Hibino & Schneider (3) found mycoplasmalike bodies in the sieve tubes of pear (*Pyrus communis* L.), affected with pear decline disease, some as a result of inoculation by grafting and some as a result of inoculation by pear psylla, *Psylla pyricola* Foerster, collected from diseased trees. Subsequently, Hibino et al. (2) found mycoplasmalike bodies in pear psylla. The present paper describes the transmission of similar organisms to periwinkle by pear psylla collected from trees affected with pear decline, and the cytology of the bodies in periwinkle plant.

**MATERIALS AND METHODS.**—Pear psylla presumed infectious and noninfectious were collected from pear trees affected by pear decline disease (northern California) and from disease-free pear trees (southern California), respectively, and held until tested in cotton organdy sleeve cages on branches cut from the tree of origin. The cut ends of the branches were placed in water, and the branches were stored at 10 C until used. The tests were made by confining 10 to 20 adult psyllas in a magnetic leaf cage and placing the cage on the leaves of periwinkle plants during feeding period (inoculation) (4) and until death (5-22 days later). At the time of the inoculative feeding, the periwinkle plants were about 4 inches high.

In the preliminary experiment, only four plants were used, two fed on by infectious psylla and two by non-infectious psylla; these four plants were held in the

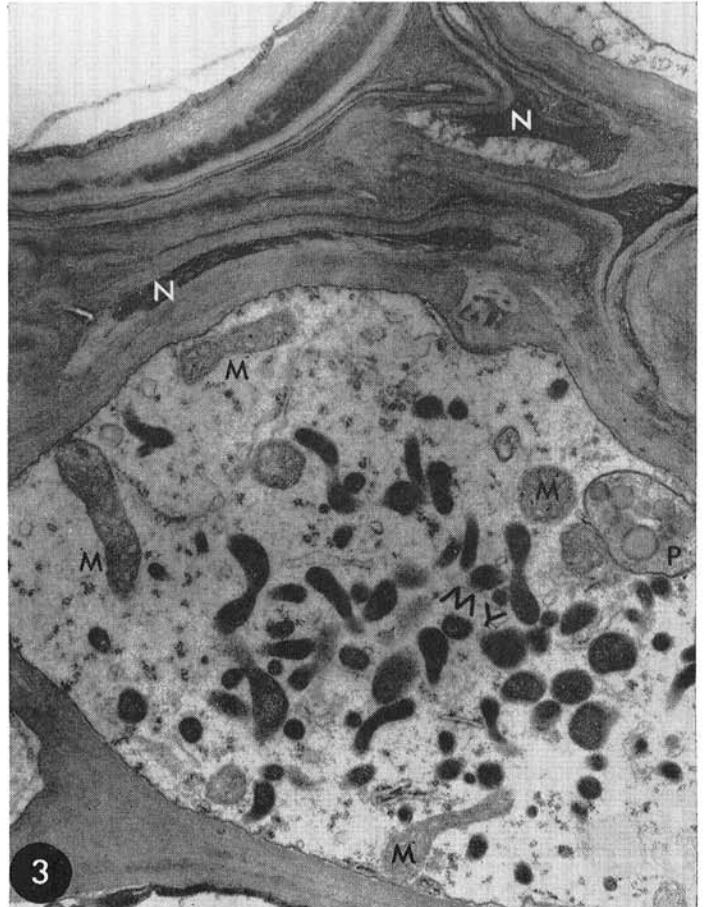
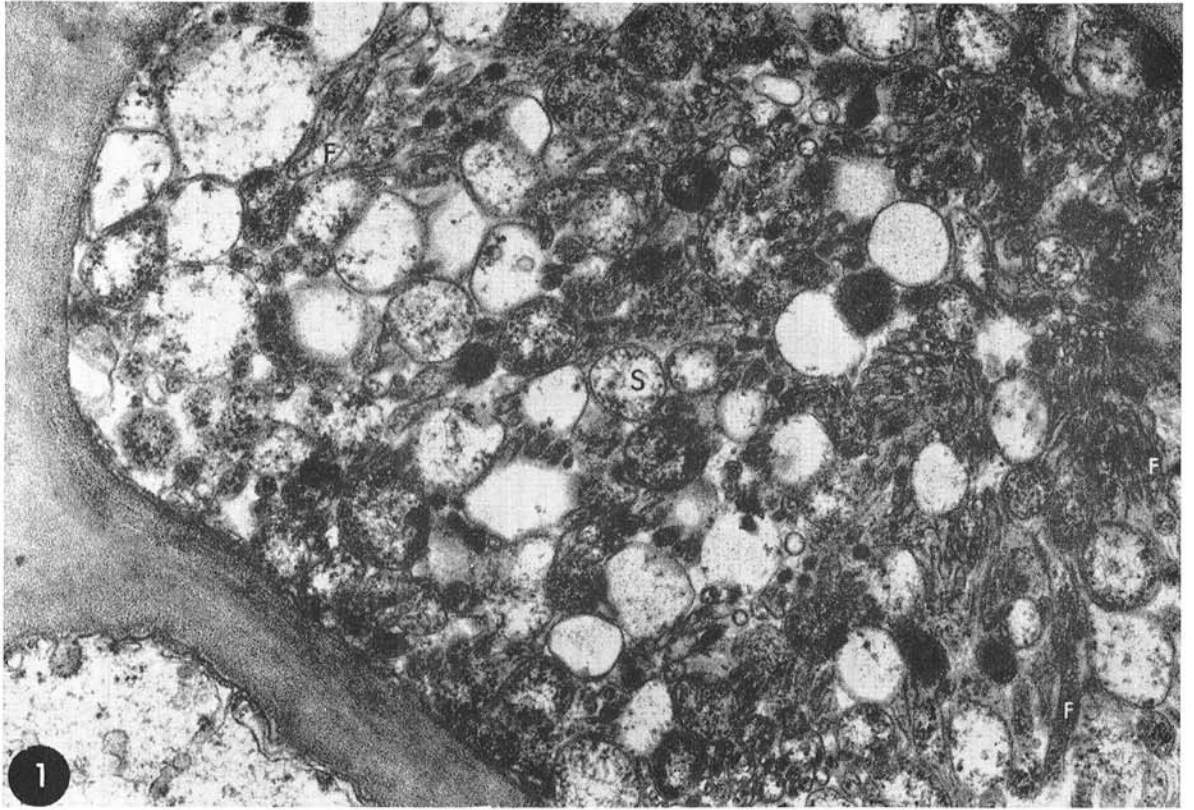
greenhouse from October 1968 to March 1969, then transplanted in the field. In each of the other two experiments, five test plants and five control plants were used; all 20 plants were held in the greenhouse from May to November 1969.

The electron-microscopic procedures described by Hibino & Schneider (3) for the detection of mycoplasmalike bodies in pear leaves were used to examine leaf sections from the periwinkle plants. Thus, briefly, the midveins of leaves were fixed in glutaraldehyde, post-fixed in osmium tetroxide, and embedded in Epon; sections were examined with a Hitachi HU-11 electron microscope.

**RESULTS.**—The four plants used in the preliminary experiment failed to show any symptoms of disease during the 5 months they were held in the greenhouse. However, 6 months after they were transplanted to a field plot, one of the plants exposed to infectious psylla became chlorotic and stunted. All four plants were then pruned severely, replanted in pots, and returned to the greenhouse. The control plants resumed normal growth, but the diseased plant failed to grow, and mycoplasmalike bodies were found in the sieve tube elements and parenchyma cells. Ribosomelike particles were present in the mycoplasmalike bodies.

The five test plants inoculated by infectious psylla in February 1969 did not show any symptoms for 5 months. In July, all 10 were pruned back. One month later, two of the test plants had failed to resume normal growth; one had wilted and died; the fourth remained in a decline stage; and the fifth showed no symptoms. The five control plants were all healthy. No examinations were made for mycoplasmalike bodies.

In a third experiment, two of the five test plants exposed to infectious pear psylla developed symptoms of disease about 5 months after the inoculative feeding. They were stunted, produced many secondary shoots, and gradually declined in vigor. The leaves were twisted slightly and were chlorotic; and the chlo-



**Fig. 1-3.** Cross sections of midveins of periwinkle leaves showing mycoplasma-like bodies transmitted from pear decline-affected trees by the pear psylla: **1**) Sieve tube element filled with many filamentous (F) and spherical (S) mycoplasma-like bodies ( $\times 33,000$ ); **2**) necrotic sieve tube element showing mycoplasma-like bodies (arrows). The unit membrane and ribosome-like particles are especially evident ( $\times 50,000$ ); **3**) necrotic sieve tube elements (N) and a phloem parenchyma cell with dense spherical and filamentous forms of mycoplasma-like bodies (MY); mitochondria (M); and plastids (P) ( $\times 14,000$ ).

rosis increased as the leaves aged until the basal leaves were completely yellow. Also, the flowers were smaller (one-third normal size) and fewer. Mycoplasma-like bodies were observed in one diseased plant; the second was not examined.

The mycoplasma-like bodies observed in periwinkle were spherical to filamentous, were about 100-600 nm in diam (Fig. 1), were bounded by a unit membrane, and contained ribosome-like particles (Fig. 2). The spherical and irregular-shaped bodies had netlike strands in the central electron transparent areas, and dense forms with ribosome-like particles and electron-dense ground substance were observed. The strands seen in the spherical bodies were not visible in the irregular-shaped bodies. Both the spherical and the dense forms were rare in parenchyma cells. Necrosis of sieve tubes was occasionally observed, and some of the necrotic tubes contain mycoplasma-like bodies (Fig. 2, 3). These bodies were not found in two control plants examined.

Our studies and that of Hibino et al. (2) and Hibino & Schneider (3) prove that mycoplasma-like particles are associated with pear decline disease. Additional work should be done to confirm or disprove our pre-

liminary identification of the mycoplasma-like particles as the causal agents of pear decline.

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