

Whitcomb R F & Davis R E. *Mycoplasma* and phytarboviruses as plant pathogens persistently transmitted by insects.

Annu. Rev. Entomol. 15:405-64, 1970.

[Entomol. Res. Div. and Plant Virol. Lab., Crops Res. Div.,
Agricultural Res. Serv., US Dept. Agriculture, Beltsville, MD]

The taxonomic position of plant pathogens transmitted persistently by insects is discussed. Viruses are diverse, with affinities with rhabdovirus, reovirus, and other virus groups. Wall-less prokaryotes have closest affinities with mycoplasmas (class *Mollitutes*). Many details of the transmission process, however, are independent of the pathogen taxon. [The SCI® indicates that this paper has been cited over 75 times since 1970.]

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October 30, 1981

"For many years it had been thought that 'viruses' that infected both plants and insects would turn out to be closely related. In the 1960s, however, structural characterization of several of these viruses showed that they were almost as different from one another as possible. For example, there were examples of reoviruses and rhabdoviruses in this assemblage of 'phytarboviruses,' as we chose to call them in our review article in 1970.

"The other thing that had happened in the 1960s was that some of the 'viruses' turned out not to be viruses at all, but instead, wall-less prokaryotes. The initial report¹ of this etiological association came from Japan in 1967, and at the time of our review had been confirmed in several laboratories, including our own.

"Actually, our review was the last one in the volume, and was 'added on' after several other scheduled reviews had been canceled. Bob Davis and I prepared the text in

a very short time—about two months—from the array of literature we had accumulated during our struggles to identify the etiological agent of the aster yellows disease.

"Subsequent work has, of course, shown how diverse the array of viruses and prokaryotes in plants and insects really is, a subject that has been amply reviewed²⁻⁴ in recent years. The major development has been the demonstration that most of the 'virus' diseases were actually caused by wall-less prokaryotes. In particular, the emergence of the genus *Spiroplasma* as a major new taxon of prokaryotes can be traced back directly to work that we summarized in our review. This genus of helical, motile mycoplasmas has since turned out to be associated with arthropods in many capacities. These include: mediator of sex ratio condition in *Drosophila*, tick borne agents pathogenic for vertebrates, and residents of the surfaces of flowers, where they probably are deposited by insects. The extreme interest generated by results on spiroplasmas has, however, tended to make many workers forget that the aster yellows pathogen and a wide array of similar agents have not yet been cultivated. The number of failures and falsely positive reports on such agents suggest that it may be a long time before some future reviewer will be able to summarize breakthroughs on cultivation of this difficult group of microorganisms.

"The 1970 review appears to have been cited as a comprehensive summary of earlier work which provided a gateway for the explosive events of the 1970s. As often as the article has been cited, one might imagine that our word 'phytarboviruses' had achieved general acceptance as a broad term for the array of taxonomically unrelated viral agents that infect both plants and insects. Actually, it has been used rarely, if at all!"

1. Doi Y, Teranaka M, Yora K & Asuyama H. *Mycoplasma*—or PLT group-like microorganisms found in the phloem elements of plants infected with mulberry dwarf, potato witches' broom, aster yellows, or Paulownia witches' broom. *Ann. Phytopathol. Soc. Jpn.* 33:259-66, 1967.
2. Saglio P H M & Whitcomb R F. Diversity of wall-less prokaryotes in plant vascular tissue, fungi, and invertebrate animals. (Whitcomb R F & Tully J G, eds.) *The mycoplasmas*. New York: Academic Press, 1979. Vol. 3. p. 1-36.
3. Whitcomb R F. The genus *Spiroplasma*. *Annu. Rev. Microbiol.* 34:677-709, 1980.
4. The biology of spiroplasmas. *Annu. Rev. Entomol.* 26:397-425, 1981.