

Ruth Allen Award

In 1965, the Ruth Allen Memorial Fund was established by means of gifts from the executor of the will of Ruth Allen, Cecil Yarwood, and from her heirs: Sam Emsweller, Mabel Nebel, Hally Sax, and Evangeline Yarwood. The award, consisting of a certificate and the income from the invested fund, is to be given for outstanding contributions to the science of plant pathology. The 1971 award was shared jointly by five distinguished Japanese scientists; it was announced at the 1971 Annual Meeting in Philadelphia, Pennsylvania.

Yoji Doi, Associate Professor of Plant Pathology, Faculty of Agriculture, The University of Tokyo, Bunkyo-ku, Tokyo, Japan; **Tatsuji Ishiie**, Chief of Laboratory of Phytopathology, The Sericultural Experiment Station, Ministry of Agriculture and Forestry, Suginami-ku, Tokyo, Japan; **Michiaki Teranaka**, Associate Professor of Plant Pathology, Faculty of Agriculture, The Utsunomiya University, Minemachi, Utsunomiya, Japan; **Kiyoshi Yora**, Professor of Plant Pathology, Faculty of Agriculture, The University of Tokyo, Bunkyo-ku, Tokyo, Japan; and **Hidefumi Asuyama**, Director of the Institute for Plant Virus Research, Ministry of Agriculture and Forestry, Aobacho, Chiba, Japan, are this year's recipients of the Ruth Allen Award.

Yellows of China-aster was scientifically described as early as 1902, and although other yellows diseases were described earlier, yellows of China-aster was often considered the type disease of a more or less coherent group distinguished by chlorosis or yellowing of leaves without mosaic, greening of petals, by phyllody of floral organs, proliferation of axillary buds, or by some combination of these and a few other symptoms. As with most virus diseases, the first systemic symptom is vein-clearing. None of many methods of mechanical inoculation of extracts from yellowed plants to healthy plants proved successful. Injections of extracts into leafhopper vectors were successful and provided a means of assay when the injected insects were tested later on susceptible plants. After an incubation period of 9 or more days, cicadellids transmitted the yellows agents in the same manner as they transmitted known viruses. No cellular pathogen was observed in association with diseased tissues or could be isolated in pure culture from them. There seemed little reason to doubt that they were caused by viruses. Indeed, they were treated no differently than many other disease agents which later proved to be viruses but which, like them, were considered to be viruses before critical experiments on filtration, chemical isolation, or electron microscopy could be performed. Many diseases of the yellows group are important economically, and were extensively investigated by many laboratories. It is certain that many negative attempts to prove virus etiology went unpublished.

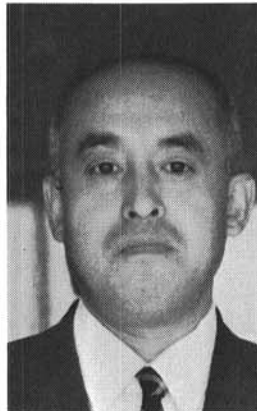
This was the state of affairs in 1967 when the Japanese scientists, Drs. Doi, Teranaka, Yora, and Asuyama published electron micrographs showing, for the first time, distinctive pleomorphic bodies in the phloem of plants with such diseases. The bodies did not occur in healthy plants or elsewhere in diseased plants. In all four such diseases they studied, they noted that the fine structure revealed in their electron micrographs distinguished the bodies from



Asuyama



Doi



Ishiie



Teranaka



Yora

normal host subcellular organelles. They interpreted them to be parasitic microorganisms similar to mycoplasmas [pleuropneumonia-like organisms (PPLo)] or chlamydiae [psittacosis-lymphogranuloma-trachoma organisms (PLT)]. They reported that the pleomorphic bodies were less numerous in early stages of infection or in plants with a mild strain of pathogen, and were absent in parts of plants that had recovered a normal healthy appearance after treatment with appropriate antibiotics. Doi et al. were unable to culture the parasites in media, although they considered the satisfaction of Koch's postulates the most important problem to be solved in the future.

Other laboratories have also experienced difficulty in culturing, from yellows diseases, organisms that can be used to reproduce the diseases. Indeed, the process of convincing a wide professional audience that this can be done and that Koch's postulates can be satisfied is still underway.

In a companion paper, Ishiie, Doi, Yora, and Asuyama showed that the antibiotics, tetracycline hydrochloride and chlortetracycline hydrochloride, administered to plants, can produce temporary recoveries from the diseases. This provided important ancillary evidence for a nonviral etiology.

Since 1967, additional evidence indicating that the pleomorphic bodies are those of the pathogen has come from other laboratories. Abundant evidence has accumulated for the constant association of the pleomorphic bodies with yellows type diseases wherever they occur. Electron microscope studies

have demonstrated the presence of such bodies in certain organs of inoculative vectors, but not in noninoculative vectors. Similarly, the mycoplasma-like bodies have been found in dodder (*Cuscuta* sp.) capable of transmitting the pathogen from plant to plant, but have not been found in healthy dodder. Tetracycline antibiotics have also been shown to interfere specifically with the transmission of the pathogen by cicadellids. Data on filtration, centrifugation, agar chromatography, and sensitivity to solvents support the idea that the pleomorphic bodies are indeed those of the pathogen.

Many research groups around the world are now following the important leads provided by the two Japanese papers cited below. It is clear that these papers have revolutionized work on plant diseases of the aster yellows type:

- Doi, Y., M. Teranaka, K. Yora, & H. Asuyama. 1967. Mycoplasma- or PLT-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. Japan* 33:259-266.
- Ishiie, T., Y. Doi, K. Yora, & H. Asuyama. 1967. Suppressive effect of antibiotics of the tetracycline group on symptom development of mulberry dwarf disease. *Ann. Phytopathol. Soc. Japan* 33:267-275.

English translations have appeared in *Rev. Plant Protec. Res.* 2(1969):84-95.