

MYCOPLASMA — LIKE ORGANISMS IN ONION WITH ASTER YELLOWS SYMPTOMS

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In 1967 Doi et al. [1] have described polymorphous bodies associated with the phloem of plants with yellows symptoms; since this time many authors have studied the mycoplasma — like organisms causing diseases of this type. At present 30 different yellows — type diseases are known; in Poland the occurrence of aster yellows, clover phyllody, mulberry dwarf and apple — tree witches broom has been observed [2]. Among these diseases, aster yellows having the widest host plant range is specially dangerous to onion. In some plantations the infection of seed onion by yellows attains 15%.

The present communication is a fragment of complex investigations of aster yellows on onion, and shows the results of electron microscopic studies to demonstrate the presence of pathogen in onion with yellows symptoms.

MATERIAL AND METHOD

Material for studies in an electron microscope were obtained from the peduncles of onion inoculated with use of vector *Macrosteles leavis*. Aster with symptoms of yellows was the source of infection. Tissues were fixed in 3% glutaric aldehyde in 0.025 M phosphate buffer, pH 7.3, and in 1% osmic acid in the same buffer. The fixed material was dehydrated with the alcohol-acetone series and propylene oxide. Epon 812 was the embedding medium [3]. Specimens were cut on a Reichert ultramicrotome. Sections were stained with uranyl acetate and lead citrate according to Reynolds [6]. The so obtained sections were observed in an Elmiscop I Siemens electron microscope. Comparable samples from healthy onion plants were fixed as above to serve as controls.

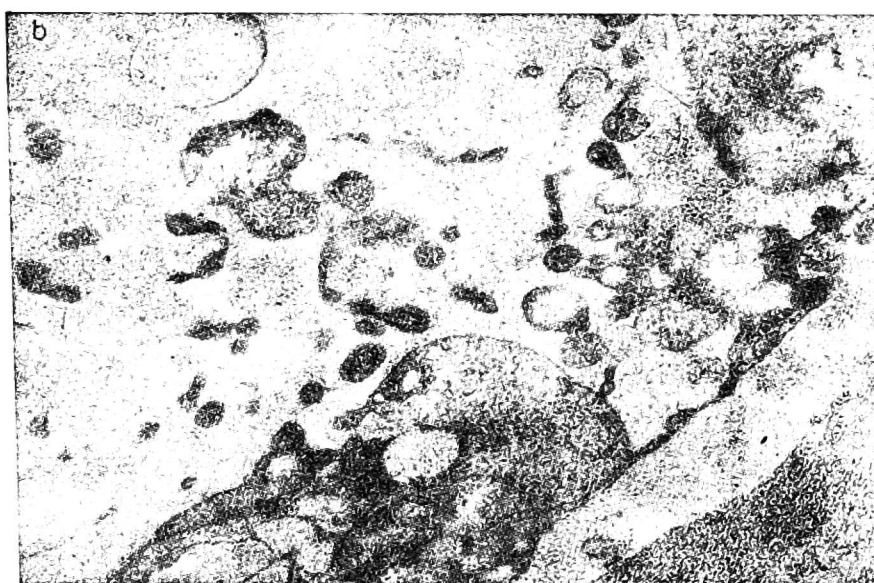
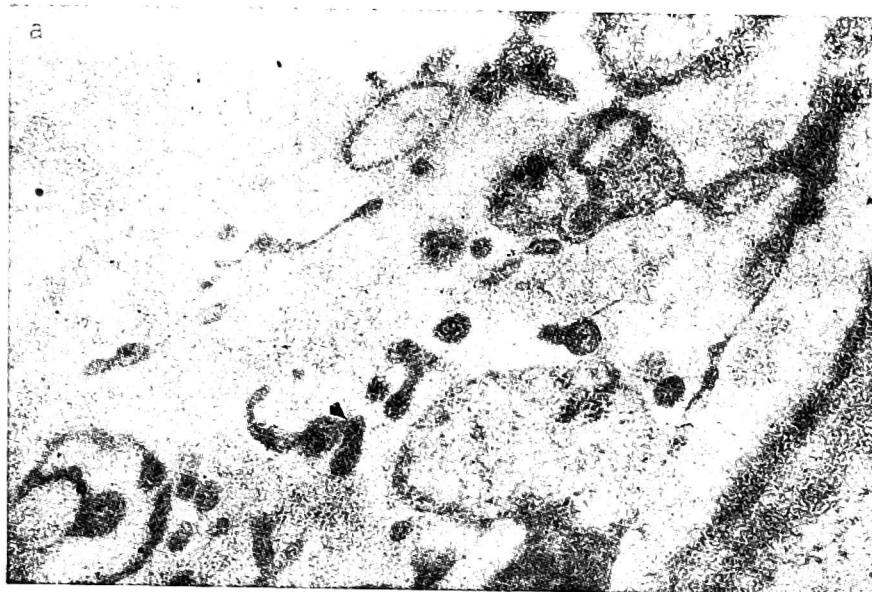


Fig. 1 a, b, c. Mycoplasma-like organisms in phloem cells of onion with aster yellows symptoms; spherical and filamentous forms are visible; magn. Fig. a — $\times 42\,000$, Fig. b — $\times 33\,600$, Fig. c — $\times 84\,000$ (Phot. L. Zielińska)

RESULTS

Phloem cells of peduncles of onion with aster yellows symptoms contain many polymorphous bodies from spherical to irregularly elongated ones (Fig. 1). All these bodies are distinctly separated from the cytoplasm of the host cell, and are filled with a fine-granular material with many ribosomes. According to many authors, the spherical forms (90-125 nm) of compact structure represent elementary bodies very similar to the animals — attacking organisms of *Mycoplasma* group (4, 5, 7). Besides, there are also greater pleomorphous forms (165-200 nm). According to Sinha [7], these structures represent an intermediate form of mature mycoplasma-like organisms. Some of them are characterized by a budding process. In addition to these forms, the infected cells of onion contain filamentous structures of different length, which sometimes are branched. According to some authors, they originate from the elementary bodies and are one of the developmental forms of mycoplasma-like organisms (5.7.).

Moreover, in the infected onion cell mature mycoplasma-like organisms are present (Fig. 2). These are large ellipsoidal bodies (400-1000 nm) surrounded by a distinct elementary membrane; they differ from the previously described intermediate forms not so much in size as in the internal structure. Whereas the intermediate forms are uniformly filled with granular inclusions, the mature mycoplasma-like organisms have a nuclear zone and peripherally situated ribosomes. Cells containing mycoplasma-like organisms exhibit increased vacuolization of cytoplasm and lack of a distinct cellular structure. No similar bodies were observed in healthy material from onion. The presented electronograms

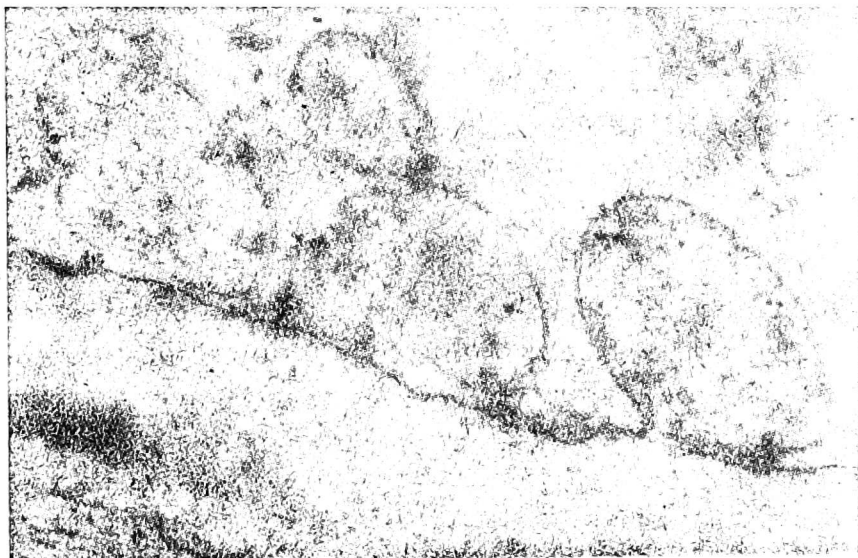


Fig. 2. Mature mycoplasma-like organisms in phloem cell of onion with aster yellows symptoms. Magn. $\times 42\,000$ (Phót. L. Zielińska)

testify to a correlation between symptoms of aster yellows on onion and the presence of mycoplasma-like organisms in the phloem of diseased onion. The present results are consistent with those of Ploaie and Maramorosch [5] who in studies on the morphology of the aster yellows pathogen have observed the occurrence of the same four forms of organisms in the infected tissues of aster and periwinkle plants.

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МИКОПЛАЗМОПОДОБНЫЕ СТРУКТУРЫ В ЛУКЕ С СИМПТОМАМИ ЖЕЛТУХИ АСТР

Резюме

В клетках флоэма лука с симптомами желтухи астр констатировано присутствие многочисленных микоплазмоподобных организмов. Были различены 4 формы этих организмов: шарообразные тела размером от 90 до 125 нм плотной структуры, плеоморфичные тела величиной от 165 до 200 нм, эллипсоидные тела величиной от примерно 400 до 1000 нм, окруженные заметной элементарной оболочкой, имеющие ядерную зону и периферийно расположенные рыбосомы, и наконец, интевидные структуры различной длины, иногда разветвляющиеся. Клетки флоэма здоровых растений не содержали микоплазмоподобных организмов.

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STRUKTURY MIKOPLAZMOPODOBNE W CEBULI
Z OBJAWAMI ŻÓLTACZKI ASTRA

Streszczenie

Obserwacje w mikroskopie elektronowym komórek floemu cebuli z objawami żółtaczki astra wykazały obecność w nich licznych organizmów mikoplazmopodobnych. Wyodrębniono cztery formy różniące się kształtem i wielkością: ciała kuliste o średnicy 90-125 nm i 165-200 nm, ciała elipsoidalne o średnicy 400-1000 nm i organizmy nitkowate często rozgałęziające się. Nie stwierdzono organizmów mikoplazmopodobnych w zdrowych komórkach cebuli.

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