

Different localization of two strains of alfalfa mosaic virus in plant cells

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Particles of plant viruses have often been found in the cytoplasm and there are also a few reports on occurrence within or association with organelles (Matthews, 1970). Remarkably, particles of the U5 strain of tobacco mosaic virus have a location different from that of other strains of this virus. Whereas tobacco mosaic virus is normally localized in the cytoplasm, particles of the U5 strain were also found in the chloroplasts (Shalla, 1968).

We now report another case of strain dependent localization. Particles of alfalfa mosaic virus (AMV) (R/1: 1.3 + 1.1 + 0.9/18: U/U: S/Ap) have thus far been found mostly in the cytoplasm or in the vacuole (Gerola et al., 1969; Hull, 1969; De Zoeten and Gaard, 1969). In an electron microscopic study on the accumulation of AMV particles in the cytoplasm Hull et al. (1970) mentioned that the chloroplasts of cells infected with some strains were often distorted and had invaginations of virus-containing cytoplasm. We studied mesophyll cells of *Nicotiana tabacum* 'Samsun NN' and of *Phaseolus vulgaris* 'Scotia' after infection with either the AMV strain 425 or with the AMV strain yellow spot mosaic virus (YSMV; Zaumeyer, 1963). Small squares (1 mm²) of leaf tissue of plants heavily inoculated with purified virus were taken daily during a period of ten days after inoculation. The samples were fixed, washed, cut and stained as described by Stols et al. (1970). Thin sections were viewed in a Philips EM 200.

Virus particles of both strains appeared in the cytoplasm two to three days after inoculation. From that time on they were also frequently found in the chloroplasts of mesophyll cells of both tobacco (Fig. 1A) and bean (Fig. 1B) infected with YSMV. They were never found in chloroplasts of plants infected with AMV 425.

In chloroplasts the particles were mostly seen within enclaves or vacuoles, surrounded by a membrane. Serial sections also supported the presence of cytoplasmic invaginations into the chloroplast. Occasionally a mitochondrion was observed inside an enclave. The distribution of the particles in the enclaves of the chloroplasts was the same as in the surrounding cytoplasm. The structures have never been found in healthy tissue or after infection with AMV 425. They may be related to the structures seen by Hull et al. (1970) in leaf cells infected by some other strains. The presence of virus particles in what appear to be cytoplasmic invaginations into the chloroplasts is not correlated with the kind of symptoms induced. YSMV causes necrotic symptoms in tobacco but chlorotic symptoms in bean, while AMV 425 causes chlorotic

Fig. 1. Electron micrographs of accumulations of YSMV particles (V) in cytoplasm and cytoplasmic invaginations into chloroplasts of tobacco leaf cell (A) and of bean leaf cell (B). Bars represent 1 μ m.

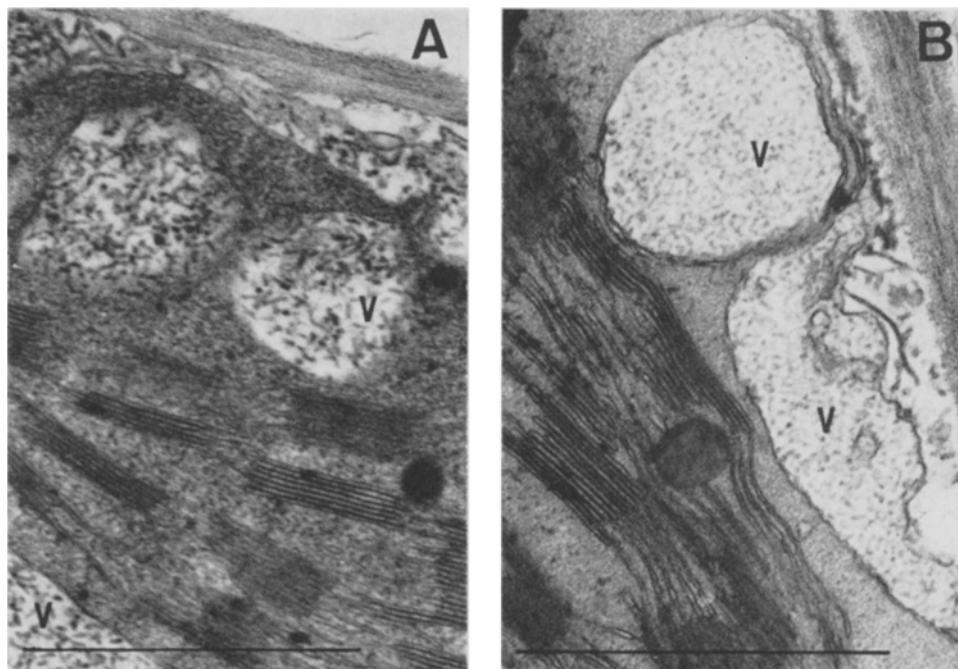


Fig. 1. Elektronenmicroscopische foto's van ophopingen van YSMV deeltjes (V) in cytoplasma en cytoplasmatische invaginaties in chloroplasten van bladcellen van tabak (A) en boon (B). Staven geven 1 μ m aan.

symptoms in tobacco and necrotic symptoms in bean (Dingjan-Versteegh et al., 1972). It is possible that products of the YSMV infection specifically induce chloroplast membranes to invaginate.

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Samenvatting

Verschillende localisatie van twee stammen van luzernemozaïekvirus in bladcellen

De cellulaire localisatie van de deeltjes van twee stammen van luzernemozaïekvirus werd bestudeerd met de elektronenmicroscop. De deeltjes van stam 425 werden, in overeenstemming met de literatuur, uitsluitend aangetroffen in het cytoplasma. De deeltjes van stam YSMV werden echter ook geregeld waargenomen in cytoplasmatische invaginaties in de chloroplasten (Fig. 1A en 1B).

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