

cell transport through the plasmodesmata or with systemic transport through the sieve elements.

4. Alfalfa Mosaic Virus and Tobacco Streak Virus

The requirement for CP accumulation for CPMR in tobacco to AIMV was demonstrated using transgenic plants that expressed the AIMV CP gene into which a frameshift mutation was introduced (20). The resulting transgenic plants accumulated transcripts, but not CP, and were not resistant to AIMV. Expression of the wild-type CP gene led to protein accumulation and resistance. Transgenic tobacco plants that carried the N gene did not form local lesions after inoculation with the necrotizing YSMV strain of AIMV. When progeny of transgenic tobacco plants that did not carry the N gene were infected with AIMV, only a low percentage of plants developed symptoms. Resistant plants accumulated no AIMV in inoculated or systemic leaves, indicating that CP accumulation interfered with an early stage of infection. It is not known whether virion disassembly is affected, because both susceptibility and resistance to infection by isolated AIMV RNAs has been reported (21–24). The different results might be a result of different CP levels in the transgenic plants or the different AIMV strains that were used.

AIMV particles contain four different RNAs, of which RNA-4 encodes the CP. To be infectious, an RNA inoculum must contain all four RNAs, or CP must be added. The CP binds to all four RNAs and is required for replication to occur (3,4). Mixtures of RNAs-1–3 have been shown to be infectious on transgenic plants, indicating that the accumulated CP is functional (24). Transgenic plants that accumulated the CP from tobacco streak virus (TSV), a member of the closely related ilarvirus family, could also be infected with AIMV RNAs 1–3 (20). The same plants were highly resistant to TSV, but not to AIMV. It was also shown that transgenic tobacco plants expressing a mutant AIMV CP gene encoding a single amino acid change close to the N terminus were susceptible to AIMV infection (21,22). However, the mutant CP was still able to bind AIMV RNA-4 in gel-shift assays. Apparently, different parts of the CP function in CPMR and in replication.

Transgenic tomato plants expressing the AIMV CP gene have also been shown to be resistant to AIMV infection (22). After inoculation, no necrosis developed on inoculated leaves and very little AIMV accumulated. No AIMV could be detected in systemic leaves of resistant plants, indicating that an early step in virus infection was affected.

5. Potato Virus X

Potato virus X (PVX) is a member of the potexvirus group and a major pathogen of potato. The CP gene of PVX has been expressed in transgenic