

Cucumber Mosaic Virus on Eggplant in Israel

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ABSTRACT

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Cucumber mosaic virus was identified from eggplant cultivars in Israel, mainly in the Jordan Valley. Identification was based on mechanical inoculations of host plants, transmission by *Myzus persicae* and *Aphis gossypii* to eggplant, tomato, and pepper, and electron microscopic detection of spherical particles in purified preparations. *M. persicae* was more efficient than *A. gossypii* as a vector of two isolates of the virus.

Infection of eggplant (*Solanum melongena*) with cucumber mosaic virus (CMV) was not common in Israel until recently, although eggplant has been reported to be a host of CMV in India (7), Israel (3,4), Italy (5), Lebanon, and Jordan (2).

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Eggplant was traditionally grown in Israel primarily in the spring and summer, but with use of polyethylene sheets for covering the plants, winter cultivation became possible and widespread. Concurrently, the number of plants with viruslike symptoms increased, and many plants were suspected of carrying CMV. Leaves of infected eggplants showed puckering and faint to severe symptoms of mosaic. Vein necrosis was followed by leaf wilt or deformation. Fruit also was deformed, smaller than

normal, and streaked with yellow. Some plants had less than the normal amount of fruit.

These symptoms were observed on some eggplant cultivars, mainly in the Jordan Valley, where seedlings are planted during September and November and covered with polyethylene sheets a few weeks after planting. Eggplants are grown similarly but less extensively in other areas such as the coastal plain. In all growing areas, CMV symptoms were observed frequently in fall-winter plantings but only occasionally in spring-summer plantings. In the latter, symptoms appear, if at all, only early in May, fade rapidly, and are not detectable in June. High summer temperatures apparently cause masking of symptoms.

This study was done to determine the identity of CMV in Israel.

MATERIALS AND METHODS

All work was done in a greenhouse (23–25 C) in which plants were sprayed

Table 1. Transmission of cucumber mosaic virus by aphids to eggplant, pepper, and tomato

| Aphid Isolate | Eggplant | Pepper | Tomato |
|-----------------------|----------|--------|--------|
| Experiment | | | |
| <i>Aphis gossypii</i> | | | |
| Fara 5 | | | |
| 1 | 2/2* | 3/4 | 1/3 |
| 2 | 2/3 | 2/4 | 1/3 |
| 3 | 1/5 | 2/3 | 2/5 |
| 4 | ... | 3/3 | 2/5 |
| Control | 0/3 | 0/3 | 0/3 |
| Mizpe Shalem | | | |
| 1 | 0/4 | 0/4 | 0/4 |
| 2 | 0/5 | 0/4 | 1/5 |
| 3 | 0/3 | 2/4 | 1/4 |
| 4 | 0/3 | 2/3 | 1/4 |
| Control | 0/3 | 0/4 | 0/4 |
| <i>Myzus persicae</i> | | | |
| Fara 5 | | | |
| 1 | 3/3 | 4/4 | 3/3 |
| 2 | 4/4 | 4/4 | 3/3 |
| 3 | ... | 4/4 | 3/3 |
| Control | 0/3 | 0/3 | 0/3 |
| Mizpe Shalem | | | |
| 1 | 1/6 | 4/4 | 3/5 |
| 2 | 1/4 | 2/3 | 2/3 |
| 3 | 1/3 | 1/4 | 2/3 |
| 4 | 1/4 | 3/4 | 1/2 |
| Control | 0/4 | 0/3 | 0/4 |

*Number of plants infected/inoculated.

once a week with pesticides.

Mechanical transmission. Samples were collected from different fields, eggplant cultivars, and locations (Gilgal, Nahalim, Jericho, Fara, Mizpe Shalem, Fazeal, Argaman, Kaliya, and Gilat). The samples were used to inoculate host plants including *Nicotiana glutinosa*, *Capsicum annuum*, *Datura stramonium*, *Physalis floridana*, *Chenopodium amaranticolor*, *Gomphrena globosa*, and *Cucumis sativus*. Infected leaf tissue was ground in 0.02 M phosphate buffer (pH 7.6) and rubbed on the leaves of indicator plants that had been dusted with Carborundum.

Transmission by aphids. Two species of apterous aphids, *Myzus persicae* Sulzer and *Aphis gossypii* Glover, were used for transmission trials.

Field material. Eggplants with symptoms were potted and kept in the greenhouse. Aphids (20–40) in leaf cages were kept on the plants for 24-hr acquisition feeding and then transferred to pepper plants, 10–15 aphids per plant, for 12–24 hr of transmission feeding. Pepper plants were then sprayed with nicotine sulfate and kept in the greenhouse until symptoms appeared.

These transmission trials failed, perhaps because the eggplants sampled

were old or because the hairiness of leaves prevented the aphids from sucking effectively.

Laboratory cultures. Two isolates of CMV maintained on *N. glutinosa* were transmitted mechanically to pepper plants that were a source for acquisition feedings 10–15 days later. Young aphids were starved for at least 60 min before a 30-sec acquisition feeding. Two apparently viruliferous aphids were then transferred to healthy plants (one true leaf) for a 24-hr transmission period. These plants also were sprayed with nicotine sulfate and kept in the greenhouse until symptoms appeared.

Aphid transmission of virus was attempted to tomato (*Lycopersicon esculentum* 'Maramande'), pepper (cv. Naharia), and eggplant (cv. Hazera 1). After symptoms appeared, viral identity was confirmed by further mechanical transmission to *P. floridana*.

Purification of the virus. A culture of CMV maintained on *N. tabacum* 'Samsun' was used for purification by the procedure of Lot et al (1). Leaves were homogenized in a mixture of citrate, thioglycolic acid, and chloroform, and after low-speed centrifugation, the virus was precipitated from the supernatant fluid with polyethylene glycol. The

resulting pellet was resuspended, and the virus was further purified by two cycles of differential centrifugation.

RESULTS AND DISCUSSION

Symptoms typical of CMV infection developed on host plants. Symptoms were systemic on *C. annuum* and *P. floridana*, local on *C. amaranticolor*, and local and systemic on *N. glutinosa*, *D. stramonium*, *C. sativus*, and *G. globosa*.

Six eggplant cultivars were infected by CMV. Cultivars Black Beauty, Black Night, Black Queen, Hazera 1, and Hazera 8 showed symptoms of mosaic. Black Queen plants at Jericho and cultivar 540 at Gilat showed severe symptoms of mosaic, and leaf deformation was observed on Black Queen plants at Fara, Mizpe Shalem, Fazeal, Argaman, and Kaliya.

Transmission of CMV. *M. persicae* and *A. gossypii* successfully transmitted isolates of CMV (Table 1). Transmission rates of the Fara 5 isolate by *A. gossypii* were 32.5% to tomato, 50% to eggplant, and up to 71% to pepper; *M. persicae* transmitted this isolate much more efficiently—100% to all three hosts. *M. persicae* transmitted the Mizpe Shalem isolate to 61% of tomato, 66% of pepper, and 23% of eggplant plants. *A. gossypii* was a less efficient vector of this isolate also, with a 23–26% transmission rate to pepper and tomato and no transmissions to eggplant.

Purification of the vector. The purified preparation was mounted on grids. Spherical particles of 28 nm observed in the electron microscope resembled CMV (6). The absorption ratio was 260:280 or 1.7, which agrees with the value of 1.69 reported by Lot et al (1).

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