

Pepino Mosaic Virus of Greenhouse Tomato

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Virus Description and Distribution

Pepino mosaic virus (PepMV) is a member of genus Potexvirus which infects mainly solanaceous plants, including tomato, potato and tobacco. It was originally detected on pepino plants (*Solanum muricatum*) in Peru in 1974. Since then, the virus was first reported in 1999 on greenhouse tomato (*Lycopersicon esculentum*) in the Netherlands and United Kingdom. Subsequently, PepMV was detected in several other European countries and North America. In British Columbia (B.C.), PepMV was first reported on greenhouse tomatoes in 2003. Artificial inoculation studies have shown that PepMV can also infect potato (*Solanum tuberosum*) and eggplant (*Solanum melongena*) but no evidence of infection has been seen on pepper (*Capsicum annum*). Based on the PepMV genomic RNA analysis, the North American strains (US genotypes), PepMV-US1 and PepMV-US2, are closely related to each other but they differ from the European (EU tomato genotype), Chilean (CH2 genotype) and Peruvian (LP genotype) strains. PepMV systemically infects tomato and it is considered as a highly infectious and readily transmittable virus.

Symptoms

PepMV, strains US1, US2 and CH2, EU and LP, can cause various symptoms in tomato. Reports on the disease severity of infected plants vary from minor to severe depending on the type of PepMV strain, age, vigour and variety of tomato plant and growing conditions in greenhouses. Symptoms are often expressed during fall and winter months when temperatures and light levels (daylight) are minimal. Initial symptoms usually appear 2-3 weeks after infection. Early symptoms are noticeable on the growing terminals (heads) of infected plants with light-green, thin or needle-like leaves and stunted growth. On leaves (Figures 1), symptoms appear as yellow angular spots and bubbly areas, mild interveinal chlorosis (yellowing) and leaf distortions such as spindly leaves. Streaks of browning may appear on stems and flowering clusters that may affect the development of flowers and fruits. Fruits sometimes show discoloration of yellow-red mosaic patterns, called marbling (Figures 2), and may lead to uneven fruit ripening. Severely affected plants become stunted and distorted. Recent studies conducted in the United Kingdom showed that PepMV was not found to reduce the bulk yield, but the quality of tomato fruit was reduced significantly. Loss of quality was mainly due to reduced fruit size, blotchy ripening, marbling, and spotting.



Figure 1. Tomato plants infected with *Pepino mosaic virus* showing symptoms on leaves (A, B).



Figure 2: Tomato plants infected with *Pepino mosaic virus* showing symptoms on fruit (A, B).

Spread

PepMV is transmitted mechanically, particularly by contact. PepMV appears to spread at a much faster rate than the other known potexviruses such as *Tobacco mosaic virus* (TMV), *Tomato mosaic virus* (ToMV) and *Potato virus X* (PVX). PepMV is readily transmitted by contaminated tools, workers' hands and clothing. Direct plant-to-plant contact and propagation by grafting can also spread the virus. PepMV can also be transmitted by seeds derived from infected tomato plants. However, the rate of transmission from seed to growing embryo is low (0.005 – 0.057%), depending on the harvest interval of seeds obtained from infected mother plants. A similar study in 2005 suggested that PepMV may be seed-borne, but it could only be detected in the seed coat and not in the embryo. A report from the Netherlands claims that PepMV can only be detected in poorly cleaned fresh seed and the virus was never detected in well cleaned seed. Its ability to spread through recirculating irrigation systems is unknown.

General control measures

Since PepMV is spread mechanically it is highly recommended that a collective management approach, i.e. a combining of cultural practices, biosecurity measures, greenhouse sanitation and disinfection practices, should be adopted to reduce the introduction and spread of the virus.

Use virus-free transplants from certified transplant nurseries. Plant PepMV resistant or tolerant tomato varieties if available.

Enforce sanitation practices by workers (particularly hands and clothing) and for pruning tools and equipment. Dipping hands and tools in skim milk prior to and after working with each plant has been reported to reduce transmission of the virus.

Scout regularly for virus symptoms and remove and deep-bury or incinerate infected or suspected tomato plants. Restricted access to virus affected rows.

Thoroughly clean and sanitize the greenhouse after harvest. Remove plant material, clean all greenhouse surfaces, and disinfect irrigation lines, etc. For selecting appropriate disinfectants and sanitation products and their use, please refer the factsheet on "[Disinfection and Sanitation Practices](#)".

Submit any suspected virus-infected plant samples to the [Ministry of Agriculture and Food - Plant Health Laboratory](#) or to a recognized plant diagnostic laboratory for diagnosis and confirmation.

Immunization (cross protection) with V10 (*Pepino mosaic virus* VX1 and VC1)

V10 is a mixture of *Pepino mosaic virus* isolate VX1 of the EU strain and VC1 of the Chilean CH2 strain. Inoculation of tomato plants in commercial greenhouses with V10 protects the plants from aggressive strains of the *Pepino mosaic virus* by cross protection.

V10 is only for use in greenhouse tomato production. V10 is NOT for use in tomato plant propagation facilities (tomato nurseries). Please refer to Health Canada's [Pest Management](#)

[Regulatory Agency](#) website for the manufacture's label on product information and application and safety instructions.

DO NOT allow transport of treated tomato plants from the greenhouse to other tomato production facilities except for the purposes of disposal (waste processing) where there is no possibility of contaminating untreated plants in production.

Caution: The attenuated isolates in V10, i.e., VX1 and VC1, may infect other plants of the Solanaceae family (e.g. pepper, potato and eggplant) and basil. Therefore, ensure that V10-treated tomato plants are isolated from these crops as well as any other crops of the Solanaceae family.

For Further Information

Factsheets on "[Management of Pepino Mosaic Virus in Greenhouse Tomatoes](#)" (Ontario).

Ling K S. 2008. *Pepino mosaic virus* on Tomato Seed: Virus Location and Mechanical Transmission. *Plant Disease* 92:1701-1705. doi:10.1094/ PDIS-92-12-1701.

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