



Tobacco Mosaic Virus (TMV) Control

Prepared for TMV (ToMV) Outbreak Meeting

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- Effective seed treatment is the key for eliminating most if not all seedborne or seed-infecting plant pathogens including TMV or ToMV. This link provides a YouTube demonstration that is very well done. [Tomato Seed Saving](#) (video by Ohio State Univ.) (also found at <http://tgrc.ucdavis.edu>)
- Once this procedure is followed, starting any seeds in a greenhouse for future studies is effective if prior sanitation is already practiced to all greenhouse surfaces, greenhouse structures (benches and flats and floors, and soil if present), materials used to support plants (stakes, string, etc.) and any item that may come in contact with plants (pruning shears, etc.). Human hands must be thoroughly cleaned before and after handling any plant material in the greenhouse.
- TMV (Tobacco Mosaic Virus) or ToMV (Tomato Mosaic Virus) or just TMV - Does it really matter? No, as both are members of the Tobamovirus group and have similar characteristics. They are very infectious and can attain high concentrations in infected tissue, and can survive in plant debris for over 20 years (if not longer). They are readily spread by human activities. Both viruses are seedborne and this occurs in tomato as well as pepper. Numerous strains of TMV or ToMV exist, giving some symptom differences in the crops they infect on both the foliage and on fruits. Generally high temperatures can mask the foliar symptoms.
- Distinguishing TMV from ToMV can be challenging. Much of the work reported on TMV in the early literature was done before ToMV was described as a separate Tobamovirus species. TMV and ToMV can be differentiated serologically or based on nucleic acid sequence, but not by phenotypic reactions across differential tomato hosts containing the TM genes for resistance. Therefore strains of either virus can be used as reference isolates for identifying unknown tomato Tobamovirus isolates.

ToMV strains

- In tomato, naming of the four recognized strains of ToMV (Tm-0, Tm-1, Tm-2 and Tm-2²) are based on the introgressed resistance (R) genes Tm1, Tm2 and Tm2² from related wild species. The Tm1 gene was introgressed from *S. habrochaites* (*L. hirsutum*) and is incompletely dominant. The Tm2 and Tm2² genes were introgressed from *S. peruvianum* (*L. peruvianum*), are considered allelic and confer dominant complete resistance.
- Strains of these viruses have emerged as resistance is overcome. Tm-2² resistance-breaking ToMV strains have been reported although these have not been found in nature.

Table 1. Tomato differentials and their reactions to ToMV

| ToMV strain | Host Differential * | | | |
|----------------|-------------------------------|-----------------|----------------------|--|
| | Monalbo **, Marmande (+/+) | Mobaci (Tm1) | Moperou 161 (Tm2) | Momor, Geneva 80, Gourmet (Tm2 ²) |
| 0 | S | R/IR | R | R |
| 1 | S | S | R | R |
| 2 | S | R/IR | S | R |
| 1.2 | S | S | S | R |
| 2 ² | S | R/IR | R | S |

*S= Susceptible; IR = Intermediately Resistant; R= Resistant.

** Differential tomato seed available from C.M. Rick Tomato Genetics Resource Center or from commercial sources.

Note: Generally, susceptible plants develop a mosaic and may also have curled and attenuated leaves. Serrations along the leaf margin may be exaggerated (fern leaf). It is important to understand that the Tm1 gene confers incomplete or partial resistance. Here, symptoms will be obvious when compared to non-inoculated plants, but less severe than those seen in inoculated, susceptible plants. Plants with the Tm2 and Tm2² genes are generally symptomless. A systemic hypersensitive reaction may also occur.