

## Viral Diseases

### Tobacco mosaic virus (TMV)

TMV is the best known of all viral diseases of plants and is worldwide in distribution. It affects more than 150 genera of primarily herbaceous, dicotyledonous plants, such as potato, tomato, cucurbits and weeds. It is symptomless on apple and grape. TMV affects plants by infecting leaf, flower and fruits and causes stunting of the infected plant.

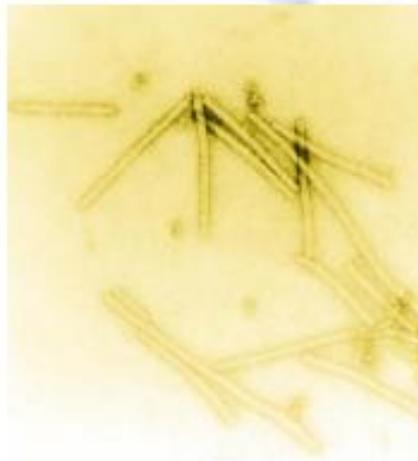
#### Symptoms:

Symptoms induced by *Tobacco mosaic virus* (TMV) are somewhat dependent on the host plant and can include mosaic, mottling, necrosis, stunting, leaf curling, and yellowing of plant tissues. Dwarfing of the entire plant and development of necrotic areas on leaf, leading to appearance of mottled dark green and light green areas on leaves. The symptoms are very dependent on the age of the infected plant, the environmental conditions, the virus strain, and the genetic background of the host plant. Strains of TMV also infect tomato, sometime causing poor yield or distorted fruits, delayed fruit ripening, and non uniform fruit color.



#### Causal organism:

The disease is caused by the virus (TMV), named as Tobamovirus, which is rod shaped and hollow with genetic material represented by one positive single stranded RNA of approximately 6400 nucleotides, 2130 protein subunits each having 158 amino acids. The protein subunits are arranged on helically coiled RNA. It is the most thermostable virus known. TMV is transmitted by mechanically through gardening instruments and is not transmitted by insects.



### **Disease cycle:**

Tobacco mosaic virus is usually spread from plant to plant via ‘mechanical’ wounds caused by contaminated hands, clothing or tools such as pruning shears and hoes. This is because TMV occurs in very high concentrations in most plant cells. When plants are handled, the tiny leaf hairs and some outer cells are inevitably damaged and leak sap onto hands, tools and clothing.

Seeds from infected plants can also carry the virus on their seed coats. The earlier the age at which the mother plant is infected, the more likely it is that the virus will contaminate the seed coat during seed harvesting. When the seed germinates, the virus may enter the seedling through small cuts caused by transplanting and handling, or during the germination/emergence process.

Once inside the plant, the virus releases its genetic code (RNA). The plant mistakes this for its own RNA, and starts to produce viral proteins.

The virus then spreads to neighbouring cells through microscopic channels in the cell walls (plasmodesmata), and eventually enters the translocation system of the plant (xylem and phloem). From here, it spreads to the entire plant.

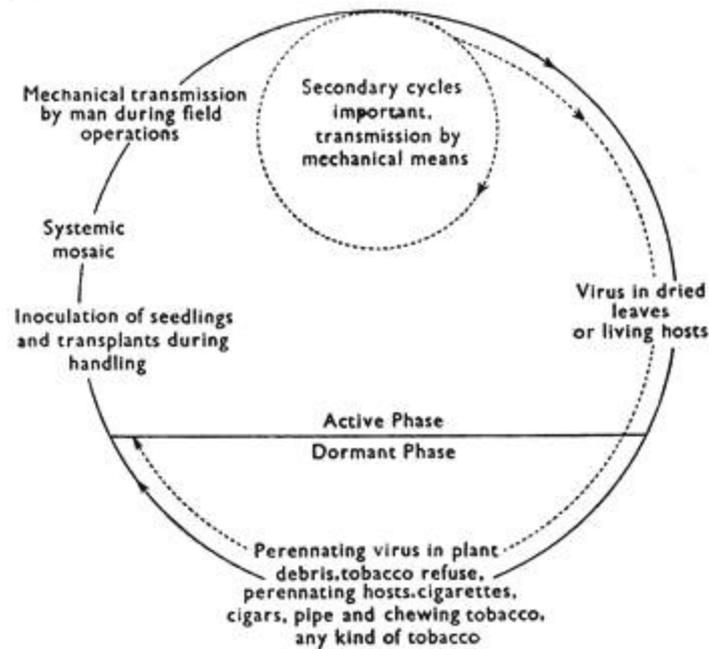


Fig. 394. Disease cycle of Tobacco Mosaic Virus.

#### Disease management:

- ❖ Sanitation and use of disease resistant varieties are most effective methods.
- ❖ TMV resistant varieties of tobacco must be grown, even if they may be of low quality.
- ❖ Removal of diseased plants and solanaceous weeds helps in reduction and elimination of subsequent spread of the virus.
- ❖ Crop rotation in the same field should be practiced with a gap of at least two years in seed beds or fields where diseased crop was growing.
- ❖ Workers in the field must wash their hands with 3% trisodium phosphate or soap.

For additional information, please refer to the provided links

<https://www.apsnet.org/edcenter/disandpath/viral/pdlessons/Pages/TobaccoMosaic.aspx>

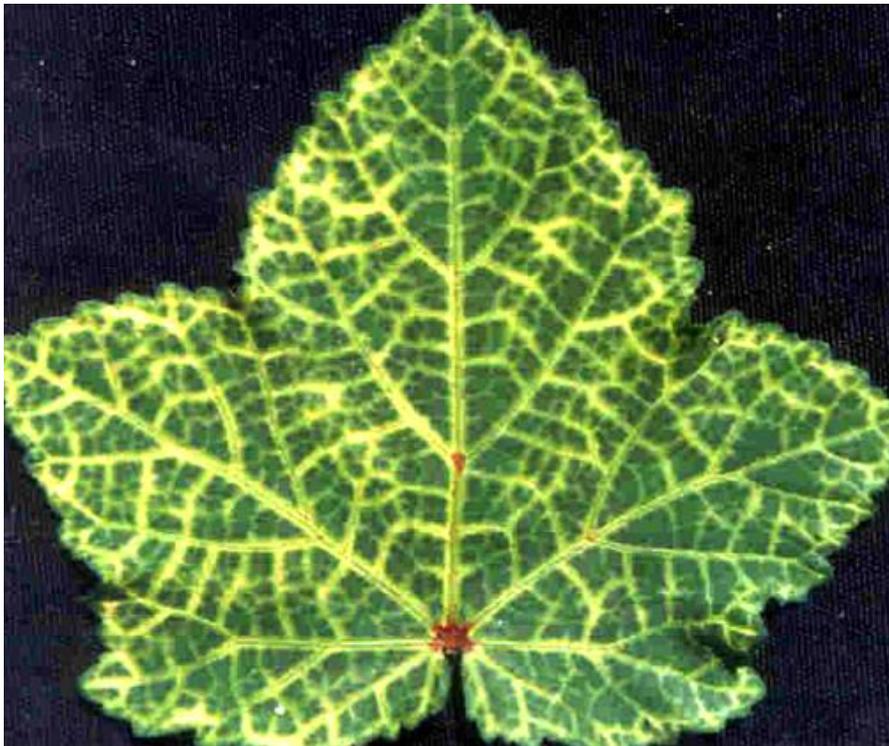
<https://www.farmersweekly.co.za/crops/field-crops/tobacco-mosaic-virus-symptoms-transmission-management/>

## Vein Clearing

This is a viral disease occurring on bhendi (Okra/Lady's Finger). Yellowing of the entire network of veins in the leaf blade is the characteristic symptom. In severe infections, the younger leaves turn yellow to become entirely chlorotic and the plant is highly stunted. The veins of the leaves will be cleared by the virus and interveinal area becomes completely yellow or white. The veins become considerably thickened. The infection may start at any stage of plant growth. Infection restricts flowering and fruits, if formed, may be smaller and harder. The affected plants produce fruits with yellow or white colour and they are not fit for marketing.

### Symptoms:

Leaves receive the infection as they are formed throughout the growth period of the plant. The initial veinal chlorosis of the leaves is followed by distinct vein clearing. The yellow network of veins is very prominent followed by thickening of veins and veinlets. If the attack is severe chlorosis may spread in the interveinal areas also, so that the entire leaf becomes yellow. Fruit size is reduced, and they become malformed and yellowish green.



### Causal organism:

The disease is caused by Yellow vein mosaic virus (YVMV) as the Veins and veinlets of infected leaves become yellow. This Virus also attacks other plants such as *Croton*, *Malvestrum*, and *Ageratum* etc. Virus is not sap transmissible, but can be artificially transmitted through grafting. However, the insect *Bemisia tabaci* is reported to spread the virus in the fields.

**Management:**

The cause of this disease is a virus for which there is no cure. The only effective control measure is prevention. The following measures for prevention could be taken to minimize yield loss:

- Use of resistance varieties
- Seeds should be collected from healthy plants from a disease-free field
- Early planting (February-March)
- The field should always be free from weeds
- Infected plants must be collected and burned
- Insecticides can be sprayed for vector control. Spray with imidacloprid, e.g. Imitaf @ 1ml/L water or dimethoate 2ml /L water at 15 days intervals, starting 20 days after transplanting

For additional information, please refer to the provided link

<http://www.biologydiscussion.com/plants/diseases-caused-by-virus-in-plants-with-control-measures/24110>