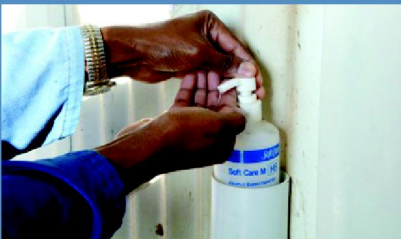


VIRUS MANAGEMENT IN VEGETABLES

Sourcing healthy seeds from a reliable source is a key to virus management.



Washing hands before entering into the fields.



Tomato leaf curl virus (TLCV)



Tomato mosaic virus (ToMV)

Viruses differ from most fungal diseases in that they infect plants systematically and no curative treatment is available.

Key Management Points

- ◆ Virus management aims at prevention through integrated management practices that involves controlling the virus source, aphids/whiteflies population and virus transmission into vegetables crops.
- ◆ Rotate vegetables with cereals to reduce virus and vector sources and where possible avoid close proximity to perennial pastures or other weeds that host viruses and vectors.
- ◆ Eliminate summer weeds that can serve as green bridge that are a host for viruses and a refuge for aphids and whiteflies.
- ◆ Insect activity is influenced by seasonal conditions and will require early monitoring in nearby crops and possible use of insecticides or cultural practice to reduce numbers.
- ◆ Encourage rapid canopy cover through early planting or maintaining high planting density.
- ◆ Bare soil is more attractive to some aphid species.
- ◆ Using high quality seeds from a reliable source as virus like TMV depend largely on seed transmissions for survival.
- ◆ Use of nylon nets in nurseries to protect seedlings from early infection from aphids and whiteflies.
- ◆ Trisodium phosphate (TSP) when applied as seed treatment will help protect seeds from some viruses like Tobacco mosaic virus (TMV).
- ◆ Continuously monitoring and roguing virus infested plants during the first 40 days after transplanting.

Introduction:

It is important to have vegetable seedlings that are free of insect pests and disease problems. The earlier the plants are infected with pests or diseases, the more severe the effect on the field crop growth and yield. One of the major yield-limiting factors in vegetable production is the lack of clean planting material owing to infection of virus diseases. Viruses differ from most fungal diseases in that they infect plants systematically and no curative treatment is available. Virus infections are spasmodic and levels depend heavily on seasonal conditions and differ greatly between years and locations. Early infection can lead to stunting, reduced tillering and plant death and losses can be high. Late infections have less impact, but can still affect seed quality. Under favorable conditions, the extent of disease incidence in major crops can be as high as 80–90 %. Therefore the primary measure should be to plant/sow virus-free seed/vegetative propagules in the fields for achieving the higher yields. Even though healthy planting material is used, under field conditions, the spread of the virus takes place through insect (aphids, whiteflies, thrips etc) and non-insect vectors (mechanical transmission) as well as by other means. High levels of virus infections have occurred in recent years resulting from infected plants in the previous spring as a virus source and a 'green bridge' of summer plant material to carry over these viruses and as a refuge for aphids.

Virus Symptoms:

Viruses exhibit a varied range of symptoms and severity relatively unapparent to plant death. The intensity and symptoms depend on virus and vegetable species and to a less extent on virus strain, vegetable variety, climatic conditions and plant stage at infection. Plants infected at an early stage or through seed will usually show more uniform discoloration and stunting, but when infected at the later stage will usually occur at the leaf tip before the whole plant starts to deteriorate. Foliage symptoms are often more visible on young leaves and include yellowing (sometimes reddening), vein clearing, leaf mottle, leaf distortion, curling of leaves, reduced size, chlorotic or necrotic spotting, or more widespread necrosis. Shoot symptoms may be seen as bunching of young leaves, growth of auxiliary shoots, bending over of the growing point, tip or apical necrosis, streaking of stems, stunting and wilting or plant death.

Sometimes, symptoms such as leaf yellowing, veining, mottling, and wilting can often be confused with nutrient deficiencies, herbicide damage or water stress



Tomato spotted wilting virus (Tospo virus)



Cucumber mosaic virus (CMV)



Vector insects

unless sufficiently distinct. It is also difficult to tell which virus is present without resorting to laboratory tests on plant samples.

Integrated Virus Management Strategy:

A virus management strategy to reduce the risk of infection may require a number of control measures relevant to the various virus and vegetable types.

Seed transmitted virus:

- ◆ Source healthy seeds bought from reliable source, tested free of viruses.
- ◆ Farmers retained seeds should only come from crops with no visible virus symptoms and seed testing should be a priority.
- ◆ Use of virus resistant cultivar if available.
- ◆ Treating seeds with chemicals like Trisodium phosphate.

Vector transmitted virus:

- ◆ Minimize the 'green bridge' for virus and vector survival in between crops. Control volunteer vegetables, legumes and weeds well before sowing and early crop weeds that may carry viruses and vectors (aphids, whiteflies, thrips etc).
- ◆ Minimize bare earth using narrow rows to minimize exposed bare soil to deter aphids entering the crop.
- ◆ Avoid crop stress through good paddock selection (soil type, no hard pan, low weed burden) adequate nutrition, no herbicide stresses and good inoculation.
- ◆ Monitor crops and neighboring areas using a sweep net. Yellow sticky traps on crop perimeters can also be a handy check for aphids whiteflies presence. Identify the species present and be prepared to use a 'soft' insecticide if there is a chance of localized flights.

Mechanically transmitted virus: (TMV, ToMV)

Once TMV or ToMV enters a crop such as tobacco or tomato, it is very difficult to prevent its spread during cultivation and particularly during the cultural operations.

- ◆ Washing hands and implements with either 3% solution of trisodium orthophosphate, bleach solution or detergent soaps.
- ◆ Decontaminating tools exposing to 0.25% sodium or calcium hypochlorite.

Roguing:

Roguing infected plants is a key strategy which is widely used especially if the crop plant is the primary or sole source of inoculum. If virus spread is relatively slow and mainly from within the crop, then roguing may be worthwhile, especially early in the season (First 40 days after transplanting). However, if the spread is occurring rapidly from sources outside the crop, roguing the crop will have no beneficial effect. Even with a perennial crop, if a disease spreads slowly, roguing and replanting with healthy plants may maintain a relatively productive stand.



Use of nylon nets in nursery:

Growing vegetable Seedlings under cover using insect proof nylon net (40-50 mesh) will keep seedlings free from insect infestation, which will eventually reduce the virus infestations. Using bamboo poles or GI pipe to support the net is found effective. To raise seedlings sufficient for one hectare, a net covered area of about 150 square meters is required, which will require one time expenditure of Rs. 10000-12000/- for procuring and stitching the net.

Standard Size of the net tunnel

Height of the tunnel: 1.40 m in the middle

Length: up to 3 m

Width: 1.5 m at each side
Larger tunnels can be built, but this size is very stable against wind and other weather factors.



1.5 m

3 m

1.4 m



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Funding

The Integrated Pest Management Innovation Lab (IPM IL) is supported by a grant from USAID and managed by Virginia Tech's Office of International Research, Education, and Development (OIREd).