

**SHORT COMMUNICATION**

**IDENTIFICATION OF WEEDS AND OTHER ALTERNATE HOSTS  
OF SOME SELECTED VIRUSES**

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**INTRODUCTION**

Many viruses use weeds or other alternate hosts, which provide a reservoir of virus from which economically important crop plants may become infected. In most cases the virus will cause a reduction in yield or quality of the infected crop, but the extent of the economic loss can vary greatly (Pandey, 2001).

Annual crops such as vegetables and cereals are usually grown from seeds and virus infection in such crops may be serious resulting in complete crop loss. Furthermore, major losses due to viruses have been reported in root and tuber crops. The Cucumber Mosaic Virus (CMV) is the most destructive virus disease and has the widest host range of any known plant virus, whereas the Tobacco Mosaic Virus (TMV) is known to infect 851 species of herbaceous plants including vegetables. The Bean Common Mosaic Virus (BCMV) is one of the most damaging bean viruses and occurs under any climatic condition that beans are grown. The Potato Virus Y (PY) infects a broad range of host plants in most climatic regions and causes severe economic damage to cultivated crops (Chaube *et al.*, 2005). Indian Cassava Mosaic Virus (ICMV) is a serious problem in cassava, grown in the low country wet zone of Sri Lanka and during heavy infestations crop loss is estimated to be 18 – 25% (Dassanayake *et al.*, 2008).

When considering control measures for such viruses, it is important to identify the initial sources of infection from which the virus spreads into or within the crop. If these sources can be controlled by using proper techniques, the potential reservoirs of virus could be eliminated. Therefore, this study was conducted to identify weeds and other alternate hosts of common virus diseases found in Sri Lanka.

## MATERIALS AND METHODS

### Collection of Diseased Weed Samples

Weeds and other alternate hosts, which showed virus-like symptoms, were collected from vegetables, and root and tuber crop cultivations during the period of 2006 – 2008, from Colombo, Kalutara, Gampaha, Galle, and Matara districts of Sri Lanka. The collected weed samples and other hosts plants were planted in an insect protected house at the Plant Virus Indexing Centre, Homagama. Soon after the collection, young leaves of suspected weeds were subjected to virus identification tests. Furthermore, each weed species were checked twice in the subsequent growth using the same virus detection techniques.

### Virus Detection Methods

#### Mechanical sap transmission

Mechanical sap transmission tests were performed by rubbing of infectious sap to a set of indicator plants to induce virus symptoms. *Chenopodium amaranticolor*, *Gomphrena globosa*, *Nicotiana benthamina*, *N. tabacum* cv. *Xanthi* and *N. debneyi* were used as indicator plants. These indicator plants in the 3 to 5 leaves stage were used for inoculating infectious sap. The virus inoculums for sap transmission were obtained from young leaves with or without symptoms. The inoculums were prepared by thorough homogenization of the tissue in a chilled motor with a pestle. The 0.5 M Potassium Phosphate buffer at pH 7.5 was used as sap extraction buffer and the leaf:buffer ratio was 1: 10 (w/v). The 400 mesh carborundum (Silicon carbide) was used to produce entry wounds.

Inoculation was done by gently rubbing a wet finger over the whole upper surface of the test leaf. Inoculated leaves were rinsed briefly with tap water and covered with a moist newspaper. Finally inoculated plants were transferred to an insect protected house and the newspaper was removed next day. Indicator plants were maintained under green house conditions for symptom development. Symptoms expressed were recorded after 2-3 week period.

### Laboratory Studies

Direct ELISA test (Clark and Adams, 1977) was carried out for all the samples collected from the field. For the virus identification, commercially available test kits [Agdia – USA, for Cucumber Mosaic Virus (CMV), Potato Virus Y (PVY) and Tobacco Mosaic virus (TMV); DSMZ kit – Germany for Indian Cassava Mosaic Virus (ICMV) and Bean Common Mosaic Virus

(BCMV)] were used. These tests were carried out according to the manufacturer's protocol. The intensity of colour reaction was measured by using a plate reader at 405 nm absorbance value. Samples with absorbance values greater than twice of healthy values (absorbance values of virus-free plant samples) were considered as positive for the particular test.

### Weeds tested by ELISA for different viruses

The number of weeds and other alternate hosts tested using ELISA for CMV was 107, ICMV was 56, TMV was 64, PVY was 56, and BCMV was 57.

## RESULTS AND DISCUSSION

### Symptoms on infected weeds samples

The symptoms of weeds and other alternate hosts collected from vegetable and tuber crop cultivations were recorded as leaf yellowing, necrosis, leaf roll, vein clearing, mosaic, leaf reduction, blisters and leaf curl.

### Virus Detection methods

#### Mechanical sap transmission

Although all the collected weeds were subjected to infectivity tests, the mechanical sap transmission test of only 14 species namely, *Eugenia fergusonii*, *Blainvillea acmella*, *Oxalis barrelieri*, *Sphaeranthus indicus*, *Sida rhombifolia*, *Aerva lanata*, *Mikania cordata*, *Acalypha indica*, *Ipomoea pes-tigridis*, *Amaranthus aspera*, *Cardiospermum halicacabum*, *Fleurya interrupta*, *Mirabilis jalapa*, and *Stachytarpheta indica*, showed virus disease-like symptoms on the indicator plants.

### Laboratory Studies

Out of the 107 weed species tested by ELISA for CMV, only 12 species of weeds namely, *Amaranthus oleraceus*, *A. aspera*, *Alternanthera spp.*, *Ipomoea sp.*, *Argyria populifolia*, *Salviya splendens*, *Ipomoea pes-tigridis*, *Phylanthus oreophilus*, *Capsicum frutescens*, *Centrosema pubescence*, *Nicandra physalia*, and *Centella asiatica* showed positive results and can be considered as alternate hosts for CMV. Furthermore out of 56 species tested for ICMV, only 9 species of weeds namely, *Acalypha ciliate*, *A. indica*, *Jatropha curcas*, *Blainvillea acmella*, *Mikania cordata*, *Ageratum conyzoides*, *Euphorbia heterophylla*, *Manihot sp.*, and *Ricinus communis* showed positive results. Only 2 weeds out of 56 plants tested, namely *Passiflora foetida* and *Colocasia esculanta* gave positive results when tested

against PVY antiserum. Moreover, out of 57 weeds tested for BCMV only 4 weeds namely, *Sphaeranthus indicus*, *Sida rhombifolia*, *Pueraria phaseoloides* and *Mimosa pudica* were positive for BCMV. Out of 64 weeds tested for TMV, none of the plants showed positive results for TMV.

## CONCLUSIONS

The study revealed that, even though some weeds carry virus like symptoms they all are not harboring common viruses tested in the study. However, some weeds were identified as alternate hosts for CMV, ICMV, PVY and BCMV. These weeds may carry some other viruses, which are not tested in the present study. Removal of weedy hosts of viruses occurring within cultivated crop would help reducing the disease incidences. Virus spreading from perennial weedy hosts growing in the vicinity to crop plants may be more difficult to prevent due to the difficulty in controlling those weeds. The results suggest the importance of weed management in crop cultivations in order to have a healthy crop growth.

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