

## 5. VIRUS DISEASES OF CROPS IN SRI LANKA

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### Introduction

In comparison with other diseases research on viruses affecting crops in Sri Lanka was started recently. It is recognized that some of the virus diseases cause severe economic loss to several crops in Sri Lanka. In the past, serious attention has not been paid to the virological dangers inherent in the import of seed and vegetative parts of plants. Several viruses that are specific to different areas of the world were thus, apparently introduced and are now well established in our country.

**The importance of tobacco white-fly.** *Bemisia tabaci* Genn. as a vector of several viruses that cause severe economic damage needs emphasis from an epidemiological stand point. Many of the viruses that have been studied are dependent on insect vectors for field transmission. These vectors have the ability to acquire viruses from their host plants at a titre too low to be detected by infectivity. Another factor that appears to be significant is the presence of vectors and host plants throughout the year permitting uninterrupted spread of viral inoculum. In addition several susceptible crops are grown during all seasons. The density of agricultural settlements (old and new) together with the replacement of hundreds of local varieties grown as mixed crops (chena) by new improved varieties with single genotype has further intensified the danger of epiphytotics and has created ideal conditons for continued spread of viral diseases.

The control of viral diseases pose several problems in Sri Lanka. The tropical climate permits vectors and host plants to thrive throughout the year. Chemical means of control over large areas against a high population of vectors for prolonged periods under a monsoonal climate is more difficult than in the temperate zone. The economic and social conditions of the peasant farmer of Sri Lanka present other obstacles. Research on virus disease control would therefore, emphasize the identification of resistant genotypes, breeding and selection of varieties resistant or tolerant to viruses together with cultural, biological and sanitational methods of disease control.

Some of the important viruses affecting crops in Sri Lanka are described below:—

### Virus/Mycoplasma Diseases of the Rice Plant

Orange leaf disease, yellow dwarf disease, and grassy stunt disease have been recognized<sup>1)</sup>. These diseases are known to be widely distributed and are regarded as destructive diseases of rice in Tropical Asia. Their distribution prevalence and economic importance has not been adequately investigated in Sri Lanka. A search for resistant material is being continued.

### Virus Diseases of Other Annual Crops

#### 1. Viruses transmitted mechanically by aphids or mites

**Tobacco Mosaic Virus** In nature TMV has been isolated from *Capsicum annum* *C. frutescens*, *Nicotiana tabacum*, *Lycopersicum esculentum* and ornamental plants<sup>2)</sup>.

Transmission is by contaminative contacts and by infested seeds.

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Control: Crop sanitation and resistant varieties.

**Cucumber mosaic virus**—CMV is widely distributed and has been isolated from over 20 species in nature. It is destructive on *Capsicum frutescens*, *Capsicum annum*, *Lycopersicon esculentum*, *Musa* sp. *Solanum melongena* and *Cucurbita* sp.

Transmission: CMV is mechanically transmissible. Spread in nature is by aphid vectors, *Aphis gossypii* and *Myzus persicae*. Virus is non persistent in the vectors<sup>9</sup>. *Strains*: There are 3 strains of CMV in Sri Lanka. The commoner ones are the type strain and the atypical strains(8).

Control: A search for sources of resistance is being made to develop resistant varieties of chillies, egg plants and tomatoes.

**Potato virus Y**—PVY occurs in nature on *Solanum tuberosum*, *Capsicum frutescens*, *Capsicum annum*, *Lycopersicon esculentum* and other solanaceous plants<sup>9</sup>.

Transmission: PVY is mechanically transmissible. The main method of field spread is by aphids, *Aphis gossypii* and *Myzus persicae*.

Control: Genetic resistance of PVY is available in tobacco and chilli.

**Potato virus X**—Hosts of PVX in nature are *Solanum tuberosum*, *Capsicum frutescens*<sup>9</sup>.

Transmission: PVX is very easily sap transmissible.

Control: Genetic resistance is not available.

**Chillie mosaic virus**—ChMV occurs on *Capsicum frutescens*, *Capsicum annum*, *Solanum nigrum*, *Solanum villosum*, *Lycopersicon esculentum*. It is destructive on *Capsicum* spp.

Transmission: ChMV is mechanically transmitted, field spread however is by *Aphis gossypii* and *Myzus persicae*<sup>9</sup>.

Control: A search for resistant genes is maintained.

*Capsicum frutescens* Var. MI-2 has field tolerance.

**Tobacco etch virus**—TEV has been recovered from *Nicotiana tabacum*, *Capsicum frutescens*. It is destructive to *Capsicum frutescens* in which it causes wilt<sup>9</sup>.

Transmission: TEV is mechanically transmissible. Field spread is by *Aphis gossypii* and *Myzus persicae*.

Control: Chilli variety "Tobasco" is resistant to this virus<sup>9</sup>.

**Tobacco ringspot virus**—TRSV has been recovered in nature from *Phaseolus mungo*, *Phaseolus aureus*, *Glycine max*, *Phaseolus lathyroides*, *Nicotiana tabacum*, *Capsicum frutescens*. TRSV is destructive in Maha season<sup>9</sup>.

Transmission: TRSV is transmissible mechanically and by mites (*Tetranychus* sp.). It is highly seed borne in *Phaseolus aureus*, and *Glycine max*. It causes sterility in *Capsicum frutescens*.

Control: Quarantine and seed certification procedures. A search is being continued for resistant genes.

**Sterility mosaic virus**—StMV occurs in nature on *Cajanus cajan* (Red Gram or Tur Dhal).

Transmission: StMV is transmitted in field by eriophyd mites (*Aceria cajani*)<sup>9</sup>.

Control: A search for resistant genes is being continued. Insecticidal sprays keep the disease in check.

**Groundnut rosette virus**—GRV occurs in nature on *Arachis hypogaea* and is transmitted by *Aphis craccivora*. Bunchy type varieties show promise of field resistance.

**Cowpea mosaic virus**—CpMV occurs in nature on varieties of *Vigna sinensis* and *Euphorbia geniculata*.

Transmission: CpMV is mechanically transmitted. Field spread however is by *Aphis craccivora*. It is not seed borne<sup>9</sup>.

Control: Genetic resistance is available.

**Soybean mosaic virus**—SbMV is confined to *Glycine max*. The virus is sap transmissible and is seed borne. Field spread is by Aphids eg., *Myzus persicae*<sup>9</sup>.

Control: Seed certification.

**Tobacco yellow net virus**—TYNV occurs in nature on *Nicotiana tabacum*, *Solanum nigrum* and *Gomphrena globosa*. It is confined to the hill country. Field transmission is via *Myzus persicae*<sup>2)</sup>. Resistant varieties are available.

## 2. Viruses Transmitted by Tobacco White Fly (*Bemisia tabaci*)

**Chilli leaf curl virus**—ChLCV occurs in nature on *Capsicum frutescens*, *Capsicum annum*, *Nicotiana tabacum*, *Lycopersicum esculentum*<sup>3)</sup>.

Transmission: ChLCV is not mechanically transmissible. Field transmission is by *Bemisia tabaci* where it is persistent.

Control: A search for genetic resistance has been unsuccessful. Systemic insecticide sprays inhibit disease spread.

**Ageratum mosaic virus**—AMV occurs in nature on *Ageratum conizoides* and *Nicotiana tabacum*. AMV is transmitted by *Bemisia tabaci*. It is not mechanically transmissible. Resistance to this virus is not known<sup>4)</sup>.

**Cucumber yellow net virus**—CYNV occurs in nature on *Cucurbita pepo*, *Cucurbita maxima*, *Luffa acutangular* and species of wild cucumbers<sup>5)</sup>.

Transmission: CYNV is mechanically transmissible but field spread is by *Bemisia tabaci*. There is indication that some cucurbit varieties show field tolerance to CYNV.

**Tomato leaf curl virus**—TLCV occurs in nature on *Lycopersicum esculentum*<sup>6)</sup>. It is not mechanically transmissible. TLCV is spread in field by *Bemisia tabaci*. Resistance is not known.

**Bandakka yellow mosaic virus**—BYMV occurs in nature on *Hibiscus esculentus*, *Hibiscus abelmoschus* and *Althaea rosea*<sup>7)</sup>.

Transmission: BYMV is not mechanically transmitted. The insect vector for field spread is *Bemisia tabaci*.

Control: Bandakka varieties MI-5 & MI-7 are resistant to BYMV.

**Sweet potato vein claring virus**—SPVVCV has been recorded only on *Ipomoea batatas*. It is not mechanically transmitted but readily inoculated by stem and tuber core grafts. Insect vector for field spread is *Bemisia tabaci*.

**Mung bean yellow mosaic virus**—MBYMV occurs in nature on *Phaseolus aureus*, *Phaseolus Lorthyroides*, *Glycine Max*, and causes severe economic losses.

Transmission: The virus is not sap transmitted and is not seed borne. *Bemisia tabaci* is the insect vector<sup>8)</sup>.

Control: A search is maintained for resistant genes.

**Soybean yellow mosaic virus**—SYMV has been recorded in nature on Soybeans *Glycine max*<sup>9)</sup>.

Transmission: SBYMB is mechanically transmissible. Field transmission is by *Bemisia tabaci*.

Control: Commercially acceptable control measure is presently not available. A search is being continued for resistant genes.

## Virus Diseases of Plantation Crops

**Papaya mosaic virus**—PMV is generally confined to the *Carica papaya*. It is transmitted by aphid vectors eg. *Myzus persicae* and a search is being continued for resistant genes.

**Banana bunchy top virus**—BTB in nature is confined to the cultivated banana varieties and *Musa textilis*.

Transmission: BTB is not sap transmissible. Field spread occur via aphid vector *Pentalonia nigronervosa*<sup>1)</sup>.

Control: Eradication of infected clumps, collateral hosts and crop sanitation procedures

keep the disease in check.

**Sugarcane ratoon stunting virus**—RSV occurs in nature on sugarcane. It is spread by planting material and contaminative contacts<sup>2)</sup>.

Control: Heat treatment of propagules and crop sanitation.

**Cacao swollen shoot virus**—CSSV occurs in nature on *Theobroma cacao*. CSSV is transmitted in field by mealy bugs *Pseudococcus njalensis* and *Pseudococcus citri*.

Control: A search is being continued for resistant varieties. Insecticidal sprays and sanitational procedures check the spread of the disease.

**Passiflora viruses**—A total of 5 viruses has been isolated in commercial plantations of *Passiflora edulis* var. *flavicarpa*—All 5 viruses are mechanically transmissible (6 & 7). No insect vector is known. Search for resistance is in progress.

### Diseases Suspected to be Caused by Mycoplasma (MLO) or Viruses

**Phyllody in sesame**—This disease occurs on *Sesamum indicum*. It is transmitted by *Orisius* sp. of insects. The affected plants remain sterile. This disease is suspected to be due to Mycoplasma-like organisms (MLO)<sup>9)</sup>.

**Little leaf of solanum melongena**—Occurs on *Solanum melongena* vector is not known. Transmissible by chip graft. Suspected to be due to Mycoplasma-like organisms (MLO)<sup>9)</sup>.

**Phyllody of chilli**—Occurs on *Capsicum frutescens*. The flower bud gets transformed into a vegetative shoot. The disease is transmitted by graft. No vector is known<sup>9)</sup>.

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### Discussion

**T. Soelaeman, Indonesia:** CSSV occurs in Sri Lanka. What strain do you have the so called New Tuaben strain? Do you apply “eradication”? (like that in Ghana?). What is the magnitude of loss by the virus?

**Answer:** Cocoa swollen shoot is endemic to specific areas in Sri Lanka.—Initially an eradication scheme was launched with some success.—Newly imported clones have reasonable tolerance to this disease, and losses due to this disease is not severe.

**D. A. Benigno, Philippines:** Is the yellow mosaic of cowpea whitefly transmitted?

**Answer:** Yes, Cowpea yellow mosaic virus is whitefly transmitted.