

Virus diseases of soybean in southeast Asian countries

Characteristics of causal viruses, distribution and control

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INTRODUCTION

About 50 viruses have been reported to occur in soybean in various parts of the world. Of these, 13 viruses have been reported from Southeast Asian countries. These viruses causes

economic yield losses, and are sometime a major limiting factor in soybean production.

Virus diseases can be diagnosed on the basis of their symptoms, the reactions of the host, vector specificity, particle morphology, serological relationships, and other features.



Fig. 1



Fig. 2



Fig. 3



Fig. 4

Fig. 1. Mosaic and rugose symptoms from SMV

Fig. 2. Faint mottle symptoms from PStV

Fig. 3. Rugose mosaic symptoms from CMMV

Fig. 4. Dwarfing symptoms from ISDV

CHARACTERISTICS OF VIRUSES

1) *Soybean mosaic potyvirus (SMV)*

SMV causes veins in young leaves to become transparent, while the leaves develop mosaic symptoms with dark green patches. Leaves with mosaic symptoms also show rugosity around the leaf veins. Some strains of the virus cause necrotic symptoms in some, but not all, soybean cultivars. Seeds from infected soybean plants sometimes show the radial type of brown mottle symptoms.

SMV has a limited host range, and infects systemically soybean, azuki bean, some cultivars of kidney bean, and sweet pea with visible symptoms.

SMV is transmitted by aphids in a non-persistent manner, and also through the seeds of soybean. The virus consists of filamentous flexuous particles about 750 nm in length.

2) *Peanut stripe potyvirus (PStV)*

PStV generally produces indistinct mottle symptoms on soybean plants, but may sometimes produce distinct mosaic or vein-necrosis symptoms.

PStV has a fairly wide host range, and infects many leguminous plants, including peanut, with systemic symptoms. PStV also gives rise to local lesions on *Chenopodium amaranticolor* and *C. quinoa*.

PStV is transmitted by aphids in a non-persistent manner. The virus consists of filamentous flexuous particles about 740 nm in length.

3) *Cowpea mild mottle carlavirus (CMMV)*

CMMV produces yellow mottle, mosaic, rugose mosaic and crinkle leaf symptoms. These symptoms vary depending on the particular cultivar of soybean infected.

CMMV has a wide host range, and infects systemically with visible symptoms virus crops such as soybean, peanut and kidney bean, and also causes local lesions on *C. amaranticolor*.

CMMV is transmitted by whitefly, *Bemisia tabaci*, in a semi-persistent manner, and also through the seeds of soybean. The virus consists

of filamentous flexuous particles about 670 nm in length.

4) *Cucumber mosaic cucumovirus, soybean stunt strain (CMV-SS)*

CMV-SS generally produces mosaic and stunting symptoms in soybean plants, but many cultivars show only indistinct symptoms. Seeds from infected soybean plants sometimes show the ring type of brown mottle symptoms.

CMV-SS has a wide host range, including soybean and tobacco plants which it infects with systemic symptoms, while it also causes local lesions in *C. amaranticolor*.

CMV-SS is transmitted by many aphid species in a non-persistent manner, and through the seeds of soybean. The virus consists of spherical particles about 30 nm in diameter.

5) *Indonesian soybean dwarf luteovirus (ISDV)*

ISDV causes dwarfing symptoms, with shortened petioles and internodes, and rolled leaves. ISDV infects only soybean plants.

ISDV is transmitted by an aphid, *Aphid glycines*, in a persistent manner. The virus consists of spherical particles about 28 nm in diameter.

6) *Mungbean yellow mosaic geminivirus (MYMV)*

MYMV causes vein yellowing symptoms along leaf veinlets, while later the symptoms become severe yellow mosaic.

MYMV infects only leguminous plants, including mungbean, black gram, kidney bean and azuki bean.

MYMV is transmitted by the whitefly *Bemisia tabaci* in a persistent manner. The virus consists of geminate particles about 18 x 30 nm.

7) *Soybean crinkle leaf geminivirus (SCLV)*

SCLV causes twisting, curling and crinkle symptoms on the leaves, and also vein enations on the underside of the leaves. It infects plants belonging to the Leguminosae, Solanaceae, and Compositae.

SCLV is transmitted by the whitefly, *Bemisia tabaci*, in a persistent manner. The virus

consists of geminate particles about 18 x 30 nm.

8) Cowpea stunt virus (CSV)

SCV causes stunting symptoms in soybean plants, with dwarfed leaves and shortened internodes.

It infects many plant species belonging to the Leguminosae. It is transmitted by the aphid, *Aphis craccivora*, in a persistent manner. The form of the virus particles of CSV has not yet been demonstrated.

9) Soybean yellow mosaic virus (SYMV)

SYMV causes distinct yellow mosaic symptoms in soybean. This virus infects soybean and peanut via aphids, and also soybean, peanut, *Nicotiana clevelandii*, *C. amaranticolor* and *C. quinoa* by sap inoculation.

SYMV is transmitted by the aphid *Aphis glycines* in a persistent manner. The form of the virus particles of SYMV has not yet been demonstrated.

10) Other viruses

Peanut mottle potyvirus, bean yellow mosaic potyvirus, soybean yellow vein virus and black-gram mottle carmovirus have been also reported, although the rate of occurrence of these viruses seems to be very low.

DISTRIBUTION AND CONTROL

SMV is considered to be the most common virus found in soybean throughout the world. In Southeast Asia, the virus is found in every country where soybean is grown. PStV is also widely distributed, since this virus is common in peanut plants throughout the region.

Of the 13 soybean viruses found in Southeast Asia, six are seedborne and five are transmitted by vectors in a persistent manner. The following efforts should be made in order to control these virus diseases.

The use of resistant or tolerant varieties is an economically sound countermeasure, while the use of healthy seed is basic to the control of seedborne viruses. The removal of sources of infection, such as infected weeds in or around fields, is desirable. The use of a fallow period for host crops is very effective in breaking the infection cycle, while spraying crops with insecticide helps to control the insect vectors.



Fig. 5. Stunting symptoms from CMV-SS



Fig. 6. Brown mottle symptoms (radial type) from SMV



Fig. 7. Brown mottle symptoms (ring type) from CMV-SS



Fig. 8. Yellow mosaic symptoms from MYMV



Fig. 9. Crinkle leaf symptoms from SCLV



Fig. 10. Enations on undersurface of leaf vein from SCLV



Fig. 11. Symptoms of dwarfed leaves and stunting from CSV



Fig. 12. Yellow mosaic symptoms from SYMV