

## OCCURRENCE OF LETTUCE MOSAIC VIRUS IN MALAYSIA

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### Ringkasan

Penyakit mosaik salad telah diperhatikan di Cameron Highland, Malaysia. Melalui suntikan air sel (sap-inoculation) virus itu boleh menjangkitkan *Chenopodium amaranticolor*, *Gomphrena-globosa*, *Lactuca sativa* dan *Lathyrus odoratus*. Jenis pokok yang boleh menahan jangkitan virus itu ialah *Brassicaceae junceae*, *Cassia occidentalis*, *Nicotiana glutinosa*, *N. rustica*, *N. tabaccum* dan *Plantago major*.

Tanda-tanda secara "systemic" terdapat di daun-daun *C. amaranticolor*, *L. sativa*, dan *L. odorata* yang disuntik manakala dengan daun-daun *G. globosa* pula hanya terdapat kecederaan di tempat-tempat yang disuntik sahaja atau "local lesions".

*Myzus persicae* membawa virus itu secara tidak langsung (non-persistent manner).

Dari kajian-kajian senarai perumah (host range), simptomatologi dan transmisi melalui kutu daun didapati bahawa penyakit ini disebabkan oleh virus mosaik salad.

### Introduction

Lettuce mosaic virus (LMV) is an important seed-borne virus disease of lettuce (*Lactuca sativa* L.) in California (Grogan *et al.*, 1955). Lettuce mosaic virus has also been reported to incur heavy losses to the summer lettuce crop in Germany (Ullrich, 1954). In Japan, LMV has been recognised as one of the most destructive diseases of lettuce in the vicinity of Tokyo (Komuro 1961).

In Malaysia, lettuce plants are commonly grown from imported seeds. Lettuce plants are often grown together with tomatoes (*Lycopersicon esculentum*), sweet peas (*Lathyrus odoratus*) and crucifers in Cameron Highlands.

A lettuce plant showing conspicuous mosaic symptom was observed in Cameron Highlands in April of 1971. No previous virus diseases have been reported on local lettuce.

This paper reports on the studies carried out with the virus.

### Materials and Methods

#### *Sap transmission*

Leaves from the infected plants were ground in 0.05M phosphate buffer (pH 7.0). Carborundum (mesh 600) was added to the inoculum following maceration of the infected leaves. Test plants were sap-inoculated with the virus using cotton buds.

#### *Aphid transmission*

Virus-free colonies of *Myzus persicae* (Sulz.), maintained in cages in the insect-proof house, were used in transmission studies. The aphids were given a pre-acquisition fasting period of 30 minutes, after which they were allowed to feed for 30 seconds on infected lettuce plants. The aphids were then transferred to healthy lettuce seedlings (3 — 4 leaf stage) for 24 hours. Five aphids were placed on each healthy plant. The plants were subsequently sprayed with malathion to kill the aphids.

## Results

### *Host range*

Four of the indicator plants tested were found to be susceptible to the virus. The plants were *C. amaranticolor*, *G. globosa*, *L. sativa* and *L. odoratus*.

No symptoms were observed in *B. juncea*, *C. occidentalis*, *N. glutinosa*, *N. rustica*, *N. tabacum*, and *P. major* when inoculated with the virus. Recovery tests from these plants onto *C. amaranticolor* were also negative.

### *Symptoms on susceptible plants*

#### 1.) *C. amaranticolor*

All the inoculated plants were found to be infected with the virus. The incubation period was 6 to 9 days. Inoculated leaves showed bright chlorotic spots and yellowing along the main veins (Fig. 1). The leaves were crinkled and slightly distorted. One or 2 weeks later, similar chlorotic spots were observed on new leaves not inoculated previously. Advanced symptoms on the leaves included brownish-red necrotic spots, sometimes coalesced to form larger spots with chlorotic margins and centres (Fig. 2).

#### 2) *G. globosa*

The symptoms observed on this plant were brown necrotic local lesions which developed 14 to 16 days following inoculation. These lesions were irregular in shape (Fig. 3). Generally, the percentage of infection was low.

#### 3) *L. sativa*

Vein-clearing was observed about 14 days following inoculation. Soon, vein banding developed on the young unfolded leaves followed by dark green blister-like mottling (Fig. 4).

The infected leaves were smaller than those of healthy controls.

#### 4) *L. odoratus*

The inoculated plants showed general chlorosis of all the leaves. This was soon followed by withering of the entire plant. Infected plants dried up and died a week later.

The virus was recovered from all the infected test plant species to *C. amaranticolor* plants.

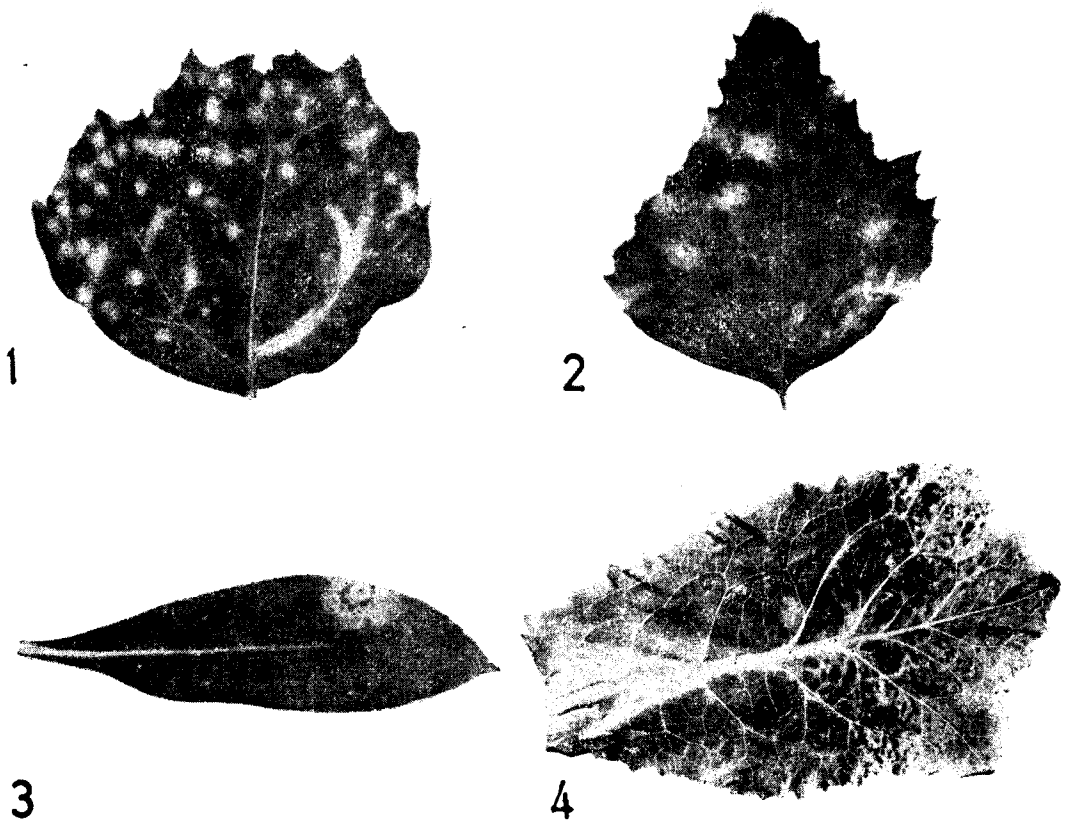
### *Aphid transmission*

*M. persicae* readily transmitted the virus from infected lettuce plants to healthy lettuce seedlings in a non-persistent manner.

*M. persicae* could also recover the virus from infected *C. amaranticolor* showing systemic chlorotic spots.

## Discussion

Six viruses have so far been reported to cause diseases of field-grown lettuce plants. The viruses are: cucumber mosaic virus (Tomlinson, 1970), lettuce big vein virus (Jagger & Chandler, 1934), lettuce mosaic virus (Jagger, 1921), lettuce necrotic yellows virus (Stubbs & Grogen, 1963), lettuce ringspot virus (Smith & Short, 1959), and tobacco necrosis virus (Fry, 1952).



- Fig. 1. Lettuce mosaic virus on *C. amaranticolor* showing systemic chlorotic spots and vein-yellowing.
- Fig. 2. Lettuce mosaic virus on *C. amaranticolor* showing brownish-red necrotic spots (advanced symptom).
- Fig. 3. Lettuce mosaic virus on *G. globosa* showing necrotic local lesions.
- Fig. 4. Lettuce mosaic virus on *L. sativa* showing dark green mottling.

Of the 6 viruses reported, lettuce big vein virus is not sap-transmissible. Of the remaining 5 sap-transmissible viruses, lettuce ringspot virus and tobacco necrosis virus do not have aphid vectors. Though lettuce necrotic yellows virus is transmissible by some aphid species, it was, however, not found to be transmitted by *M. persicae* (Stubbs & Grogan, 1963). Moreover, host range studies with the virus reported in this paper showed that it could not infect *N. glutinosa*, a host of lettuce necrotic yellows virus.

The virus from Cameron Highlands, cucumber mosaic virus and lettuce mosaic virus are readily sap-transmissible and they are transmitted by *M. persicae* in a non-persistent manner. The virus on lettuce, reported in this paper, like LMV, infects *C. amaranticolor* systemically while cucumber mosaic virus causes local lesions on the inoculated leaves of this indicator plant. Unlike cucumber mosaic virus which causes systemic mottling in *N. glutinosa* and *N. tabacum*, the present virus and LMV do not infect these 2 plants. The symptoms induced by the present virus on susceptible hosts are similar to those described for lettuce mosaic virus in England (Holling, 1957) and in Japan (Y. Komuro, personal communication).

The mosaic disease of lettuce observed in Cameron Highlands is identical to that of lettuce mosaic virus based on symptomatology and transmission characteristics.

Since there is no previous record of LMV and moreover, LMV is seed-borne in lettuce (Newhall, 1923), the author suspects that this virus has been introduced through infected lettuce seeds into Malaysia. Grogan *et al.*, (1952) reported that seed transmission was probably the major factor in the spread of the disease.

*Acyrtosiphon scariolae* Nevs, *A. scariolae harri* (Essig.), *Aphis gossypii* Glover., *Macrosiphum euphorbiae* (Thos.), *M. persicae*, and *Nasonovia latucae* (L.) have been reported to transmit LMV (Kennedy, *et al.*, 1962). *M. persicae*, one of the important vector of LMV, is commonly found to colonise a number of plants in Malaysia. The presence of this vector will no doubt contribute significantly to the spread of the virus.

The host range of LMV includes a number of weeds which may serve as alternative hosts of the virus (Costa & Duffus, 1958). One of these, *Stellaria media*, is found in Cameron Highlands. With the presence of the alternative host and the vector, LMV may constitute a serious threat to lettuce growers in the country. To avoid serious losses due to LMV, it is advisable to assay imported lettuce seeds for LMV. Any seeds found to be infected with LMV (0.1%) should not be used (Zink, *et al.*, 1956; Tomlinson, 1962).

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### Summary

A mosaic disease was observed on lettuce in Cameron Highlands, Malaysia. The virus was readily sap-transmitted to *Chenopodium amaranticolor*, *Gomphrena globosa*, *Lactuca sativa* and *Lathyrus odoratus*. The following plants; *Brassicaceae junceae*, *Cassia occidentalis*, *Nicotiana glutinosa*, *N. rustica*, *N. tabacum*, and *Plantago major* were not susceptible to the virus.

Systemic symptoms were produced on *C. amaranticolor*, *L. sativa*, and *L. odorata*. Local lesions were produced on leaves of *G. globosa*.

*Myzus persicae* (Sulz.) readily transmitted the virus in a non-persistent manner.

From host range, symptomatology and aphid transmission studies, the disease was found to be caused by lettuce mosaic virus.

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