

Short communication

Strawberry latent ringspot virus in lilies

J. Cohen, A. Gera and G. Loebenstein

Department of Virology, Agricultural Research Organization, The Volcani Center, Bet Dagan, Israel

Accepted 29 September 1994

Key words: SLRV, Stargazer, tubules, nepovirus, immunoelectron microscopy

Abstract

Strawberry latent ringspot virus was detected in the oriental lily hybrid 'Stargazer' grown in Israel from bulbs imported from Europe. Virus infection was associated with asymmetrical opening of flowers. Virus identification was based on electron microscopy, host range and serology.

Introduction

Various viruses have been reported to infect lilies (*Lilium* sp.) (for a list of viruses, see Tomassoli and Benetti, 1988). In Israel the most prevalent viruses are lily symptomless carlavirus (LSV), cucumber mosaic cucumovirus (CMV), tulip breaking potyvirus (TBV) and a variant of TBV, TBV L6 which induces local lesions on *Chenopodium amaranticolor* [Alper et al., 1982]. Indications for the presence of lily X potexvirus were obtained recently [A. Kuperman, personal communication]. During the winter of 1994 unfamiliar symptoms were observed in the oriental hybrid 'Stargazer' a botanical hybrid of unknown parents [Jefferson-Brown, 1988], grown from bulbs imported from Europe.

Here we report the presence of strawberry latent ringspot virus (SLRV) in lilies showing asymmetrical opening of flowers (AF).

Results and discussion

'Stargazer' plants with strong mosaic symptoms on the leaves and flowers that opened asymmetrically (Fig. 1) were observed in greenhouses in the Sharon Valley of Israel. Plants were tested for CMV, LSV and TBV using the enzyme-linked immunosorbent assay (ELISA). All plants were found to be positive for LSV, some for CMV and

TBV, and others were positive for different virus combinations. Flower symptoms appeared similar, irrespective of whether the plants were infected by LSV, CMV or TBV or a combination of these viruses.

Lily plants with AF symptoms and free from CMV and TBV as determined by ELISA, but infected by LSV, were used. Leaves and scales were ground in 1% K₂HPO₄ in the cold, and used for the inoculation of healthy test plants. After inoculation, the herbaceous host, were rinsed with tap water and maintained in an insect-proof greenhouse at 23 ± 2 °C with 13 h lighting. Plants were examined daily for virus symptoms.

Mechanical inoculation of *Chenopodium amaranticolor* and *C. quinoa* resulted in chlorotic or necrotic lesions, with subsequent systemic chlorotic mottle symptoms. *Nicotiana benthamiana* and *N. clevelandii* reacted with systemic mosaic and dwarfing of the leaves, while *N. tabacum* cv. White Burley and *Petunia hybrida* were symptomless. These symptoms were similar to those described by Murant (1987) for SLRV. That *N. tabacum* cv. white Burley and *P. hybrida* gave symptomless infections, eliminates the possibility of infection by most isolates of arabis mosaic nepovirus (ArMV).

Two weeks after inoculation, plants were checked for the presence of virus by electron microscope (EM) observations. Samples for EM were prepared by grinding leaf and scale material



Fig. 1. Three types of asymmetrical opening of flowers in the oriental lily hybrid 'Stargazer' infected with strawberry latent ringspot virus (SLRV) and lily symptomless virus (LSV).

with the aid of a mortar and pestle in 0.1 M phosphate buffer, pH 7.0, at a ratio of 1:10 (w/v). EM grids were floated on a drop of the homogenate for 1–2 min; after washing, they were stained with 2% uranyl acetate aqueous solution. In extracts from lily leaves or scales, only LSV particles were observed. However, in extracts from lesions on *C. amaranticolor*, mechanically inoculated with lily extracts, characteristic tubules containing isometric particles were observed. These tubules had a double membrane, similar to those found in SLRV infected tobacco and cucumber [Ikin and Frost, 1976].

SLRV was also identified by immunoelectron microscopy (IEM) [Milne and Luisoni, 1977]. SLRV and ArMV antisera were a gift from Prof. A. A. Brunt, Littlehampton, U.K. Antiserum against tobacco ringspot nepovirus (TRSV) was obtained from the American Type Culture Collection (ATTC). Antisera were diluted in 0.1 M phosphate buffer, pH 7.0. Dilutions of 1:1000 and 1:10 were used for trapping and decoration, respectively. When SLRV antiserum was used in IEM for trapping and decoration, isometric particles were observed in extracts from lily leaves (Fig. 2) and scales. Similar trappings and decorations were obtained from extracts of all

the above mentioned infected and symptomless test plants. Highest concentrations of particles were obtained from extracts of infected *N. benthamiana* plants.

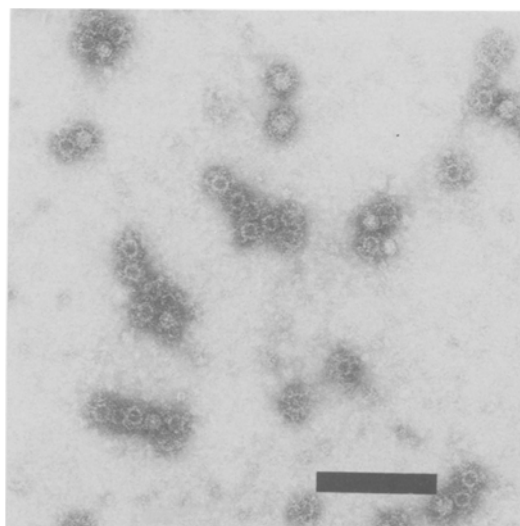


Fig 2. Electron micrograph of strawberry latent ringspot virus (SLRV) particles from crude sap preparations of infected 'Stargazer' lily, trapped and decorated with SLRV antiserum, and stained with 2% uranyl acetate. Bar = 0.2 μ .

No trapping or decoration was obtained when antisera to ArMV or TRSV were used.

In Fig. 2 some particles are shown to be penetrated by the stain and others not, presumably corresponding to the bottom (B) and top (T) component, the latter being deprived of nucleic acid [Murant, 1974].

In Israel, SLRV was found only once in roses. No SLRV was found in lilies grown from local stocks of lily. It seems, therefore, that SLRV in 'Stargazer' was introduced with the bulbs from Europe. To the best of our knowledge, this is the first report of SLRV in lilies.

Contribution No. 1349-E, 1994 series, from the Agricultural Research Organization, the Volcani Center, Bet Dagan, Israel.

References

- Alper M, Koenig R, Lesemann DE and Loebenstein G (1982) Mechanical transmission of a strain of tulip breaking virus from *Lilium longiflorum* to *Chenopodium* sp. *Phytoparasitica* 10: 193–199
- Ikin R and Frost RR (1976) Virus diseases of roses. II. Strawberry latent ringspot virus. *Phytopath Z* 87: 205–223
- Jefferson-Brown M (1988) The Lily, for Garden, Patio and Display David & Charles Inc. North-Pomfret, Vermont, USA. pp 164
- Milne RG and Luisoni E (1977) Rapid immunoelectron microscopy. In: Maramorosch K and Koprowski H (eds), *Methods in Virology*. Vol 6 (pp 265–281), Academic Press, New York, NY
- Murant AF (1974) Strawberry latent ringspot virus. CMI/AAB Descriptions of Plant Viruses No 126
- Murant AF (1987) Raspberry yellow dwarf and associated disease of *Rubus* caused by arabis mosaic and strawberry latent ringspot virus. In: Converse RH (ed), *Virus Diseases of Small Fruits*. USDA Agric Handbk No 631 (pp 204–211)
- Tomassoli L and Benetti MP (1988) Tobacco rattle virus in triple infection in lily. *Adv Hort Sci* 2: 117–119