Neth. J. Pl. Path. 78 (1972) 69–71 SHORT COMMUNICATION

Tobacco mosaic virus in Hippeastrum hybridum

G. T. N. DE LEEUW

Phytopathological Laboratory 'Willie Commelin Scholten', Baarn

Accepted 26 November 1971

Four viruses have been reported to occur in mosaic-diseased *Hippeastrum* plants: Sunflower mosaic virus (Smith, 1957), Tomato spotted wilt virus (Smith, 1935), Cucumber mosaic virus (Kahn and Smith, 1963) and *Hippeastrum* mosaic virus (Brants and van den Heuvel, 1965). These viruses have been distinguished by host range, symptoms, physical properties, serology and electron microscopy.

Elongated particles, mainly flexuous rods of differing dimensions have been found in dip preparations of mosaic-diseased *Hippeastrum* plants (Table 1). Herbas (1964) considered the rigid rods of 340–380 nm to be cleavage products of the long flexuous rods of 690–740 nm.

Double infections of mosaic-diseased *Hippeastrum* plants have been reported by several authors. From mosaic-diseased *Hippeastrum* plants Kahn and Smith (1963) isolated Cucumber mosaic virus (CMV) and also an unidentified virus that was not able to infect tobacco plants. Iwaki (1967) obtained CMV and *Hippeastrum* mosaic virus (HMV) from *Hippeastrum*. Herbas (1964) probably studied *Hippeastrum* plants doubly infected by HMV and tobacco mosaic virus (TMV). However, in spite of the length of the particles and the induction of local lesions in leaves of *Nicotiana tabacum* 'Xanthi-nc', *N. glutinosa*, *Phaseolus vulgaris* and *Gomphrena globosa* test plants, he did not postulate that the short rigid rods could be TMV.

In this study a virus was repeatedly isolated from two mosaic-diseased *Hippeastrum* plants. This virus was obtained on three different occasions from one *Hippeastrum* plant and on one occasion from another plant. The possibility of contamination by

Tabel 1. Length of virus particles that have been found in dip preparations of mosaic-diseased *Hippeastrum* plants.

Particle length	Particle form	Author
500–550 nm	flexuous	Procenko and Procenko, 1964
620 nm	flexuous	Corbett, 1965
643 nm	flexuous	Brants, Fokkema and de Bode, 1970
690–740 nm	flexuous	Herbas, 1964
600–800 nm	flexuous	Iwaki, 1967
340–380 nm	rigid	Herbas, 1964

Tabel 1. Lengte van virusdeeltjes aangetroffen in dooppreparaten gemaakt van bladeren van mozaïekzieke Hippeastrum planten.

viruses occurring on the leaves was excluded by washing the leaves with soap and water before sap was expressed. The virus isolates induced mosaic symptoms in *N. tabacum* 'Samsun' plants at nine days after inoculation and these symptoms closely resembled those induced in 'Samsun' plants by TMV. Therefore the virus isolated from *Hippeastrum* was compared with the normal strain of TMV on the basis of symptoms induced in test plants, physical properties, serology and electron microscopy.

Sap expressed from 'Samsun' plants infected with the virus isolated from *Hippeastrum* was tested on *N. tabacum* 'Samsun', *N. tabacum* 'Xanthi-nc', *N. hybrida (N. clevelandii* × *N. glutinosa)*, *Gomphrena globosa*, *Hyoscyamus niger*, *Phaseolus vulgaris* 'Scotia' and *Datura stramonium*. A comparable set of test plants was inoculated with sap from 'Samsun' plants infected with TMV. In any pair of such test plants the symptoms were identical, regardless of the origin of the inoculum.

Sap from 'Samsun' plants infected with the *Hippeastrum* virus, when tested on 'Xanthi-nc' leaves, gave a dilution end-point of 10^{-6} and a thermal inactivation point of 95 °C. For the normal strain of TMV a dilution end-point of more than 10^{-6} and a thermal inactivation point of 93 °C have been stated (Smith, 1957).

Sap expressed from 'Samsun' plants infected with the virus isolated from *Hippeastrum* reacted positively with TMV-antiserum in agar double-diffusion tests, whereas no reaction was obtained with sap from healthy 'Samsun' plants.

Electron microscopy of a specimen obtained after purification by rate-zonal density gradient centrifugation showed the presence of virus rods with a length of 287 nm. The rods were usually rigid but sometimes slightly curved. Comparable particles, however, were not detected in dip preparations of fresh leaves of the *Hippeastrum* plants form which the virus was isolated. In these dip preparations only flexuous HMV rods of 648 nm were seen. It is probable that TMV is present in the *Hippeastrum* plants studied, but at a very low concentration.

Sap transmission of viruses isolated for *Hippeastrum* has been reported by Kahn and Smith (1963) and by Iwaki (1967) for CMV and by Herbas (1964), Brants and van den Heuvel (1965) and Iwaki (1967) for HMV. Herbas (1964) stated that the short rigid rods of 340–380 nm were transmitted to *Hippeastrum* by sap. The virus isolated from *Hippeastrum* in this study was not transmitted in inoculations with sap from *Hippeastrum* to *Hippeastrum*. Presumably the transmission of this virus was blocked by virus inhibitors (Brants and van den Heuvel, 1965).

It was concluded that the virus isolated form *Hippeastrum* showed close similarity with the normal strain of TMV, except for the length of the particles, which for the normal strain has been stated to be approximately 300 nm (Brandes, 1964). However, the crucial test – that the isolated virus could infect healthy *Hippeastrum* plants and could be re-isolated from these plants – was not fulfilled.

Acknowledgment

Dr J. Dijkstra, Laboratory of Virology, Agricultural University, Wageningen, kindly provided a purified preparation of the normal strain of TMV. Electron microscopy was performed at the Laboratory for Electron Microscopy of the University of Amsterdam.

Samenvatting

Tabaksmozaïekvirus in Hippeastrum hybridum

Uit *Hippeastrum hybridum* planten werd een virus geïsoleerd dat in diverse waardplanten symptomen induceerde overeenkomend met symptomen welke door de normale stam van het tabaksmozaïekvirus in eenzelfde waardplantenreeks werden veroorzaakt.

De inoculatie van *Hippeastrum*-planten met het uit *Hippeastrum* geïsoleerde TMV slaagde niet. Mogelijk werd dit veroorzaakt door de aanwezigheid van virusremstoffen in *Hippeastrum*.

References

Brandes, J., 1957. Eine elektronenmikroskopische Schnellmethode zum Nachweiss faden- und stäbchenförmiger Viren, insbesondere in Kartoffeldunkelkeimen. NachrBl. dt. PflSchutzdienst, Stuttg. 9: 151–152.

Brandes, J., 1964. Identifizierung von gestreckten pflanzenpathogene n Viren auf morphologischer Grundlage. Mitt. biol. BundAnst. Ld-u. Forstw. 110, 130 pp.

Brants, D. H. & van den Heuvel, J., 1965. Investigation of *Hippeastrum* mosaic virus in *Hippeastrum hybridum*. Neth. J. Pl. Path. 71: 145–151.

Brants, D. H., Fokkema, N. J. & Bode, de R., 1970. Further identification of *Hippeastrum* mosaic virus. Neth. J. Pl. Path. 76: 171–173.

Corbett, M. K., 1965. The nature of plant viruses. Rep. Fla agric. Exp. Stn 1965: 157–158.

Herbas, R. A., 1964. El mosaico de los Amaryllis y su agente causal. Turrialba 14: 140–147.

Iwaki, M., 1967. Viruses causing mosaic diseases of Amaryllis in Japan. Ann. phytopath. Soc. Japan 33: 237–243.

Kahn, R. P. & Smith, F. F., 1963. Transmission of a virus inciting Amaryllis mosaic symptoms. Pl. Life 19: 133–145.

Procenko, A. E. & Procenko, E. P., 1964, In: Plant Virology, Proc. 5th Conf. Czechosl. Pl. Virologists, Prague 1962: 242.

Smith, K. M., 1935. Diseases of ornamental plants caused by the Tomato spotted wilt virus. Jl R. hort. Soc. 60: 304–310.

Smith, K. M., 1957. A textbook of Plant Viruses. London. 2nd ed.

Address

Phytopathologisch Laboratorium 'Willie Commelin Scholten', Javalaan 20, Baarn, the Netherlands

---

Book announcement

Crop loss assessment methods. FAO Manual on the evaluation and prevention of losses by pests, diseases and weeds. Edited and printed by FAO, Rome, 1970, loose leafed, circa 200 unnumbered pages, many illustrations.

The allocation of funds to crop protection purposes necessitates difficult decisions, which should be supported by reliable information on crop losses. Methods to assess crop losses are given and exemplified. For a review, see: Int. Newsl. Pl. Path. 1 (1971) No 2.