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ETIOLOGY OF VIRUS DISEASE OF THE AROID *AMORPHOPHALLUS RIVIERI*

*NADA PLEŠE, GORDANA HORVAT and MERCEDES WRISCHER**

(Department of Botany, Faculty of Science, University of Zagreb and *Ruđer Bošković Institute, Zagreb)

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A potyvirus was isolated from the aroid *Amorphophallus rivieri* Dur. with conspicuous mosaic and mottling symptoms. Based on the host range reaction and cytopathology the virus is very probably an isolate of dasheen mosaic virus. It seems to be the first report about virus infection of this aroid plant.

Introduction

Many cultivated aroids are of considerable economic significance as edible plants or as ornamentals, especially as foliage plants. They are mostly propagated only vegetatively and because of that can harbour virus indefinitely leading to chronic virus infections. Although several viruses are known to infect aroids, none is as prevalent or widespread as dasheen mosaic virus (DMV, Zettler and Hartman 1986, 1987), a potyvirus initially described by Zettler et al. (1970) and Abo El-Nil et al. (1977). The virus occurs throughout the world infecting species of at least 16 genera of the family *Araceae* including genus *Amorphophallus* (Zettler and Hartman 1987) whose members are also used as edible and as ornamental plants.

Sufficiently reliable information about the susceptibility of *Amorphophallus* to DMV originates from Hartman (1974) in Florida, who ascertained the natural infection in *A. campestris* on the basis of infectivity assays to indicator plant and presence of filamentous virus particles. Besides, a virus-like disesase was described also earlier on *A. campanulatus* species in India (Capoor and Rao 1969, Chatterjee et al. 1971).

Plants of aroid *A. rivieri* Dur. with conspicuous foliar discoloration (mosaic and mottling) and slight stunting (Fig. 1 A, B) were observed in a greenhouse collection of the Botanical Garden in Zagreb (Yugoslavia). The paper deals with investigations to ascertain whether the specimens of *A. rivieri* are also infected with DMV or an other potyvirus.

Material and Methods

For virus isolation several conventional test plants were manually inoculated with infected leaf tissue of *A. rivieri*. Leaf pieces were triturated by adding 0.06 M phosphate buffer (pH 7.1) containing 0.1% TGA. The slimy homogenate was rubbed on carborundum dusted leaves of six plants of each test species used and thereafter they were immediately rinsed with tap water. When symptoms had not developed, return inoculations were made to *Tetragonia expansa* by adding the buffer without TGA. *T. expansa* served also as a source of the virus for additional trial to infect test plants which at the isolation of virus from *A. rivieri* remained healthy.

For detecting virus particles leaf extracts of infected plants were negatively stained in 2% sodium phosphotungstate pH 7.0 and examined in a Siemens Elmiskop I. For ultrastructural observations our standard procedure was used (Pleše and Wrischer 1978); infected leaf tissue was fixed in 1% glutaraldehyde, postfixed in 1% osmium tetroxide and after dehydration embeded in Araldite. The sections were stained with uranyl acetate and lead citrate and analysed in the electron microscope.

Results and Discussion

We tried to transmit virus isolate from *A. rivieri* to 12 non-aroid test plant species. However, we succeeded in infecting only *Chenopodium amaranticolor*, *C. murale* and *T. expansa* (Fig. 1 C) which developed chlorotic local lesions without systemic invasion. By back inoculation to *T. expansa* no virus was detected in inoculated leaves of *C. quinoa*, *Cucumis sativus* »Delicates«, *Datura stramonium*, *Gomphrena globosa*, *Nicotiana clevelandii*, *N. glutinosa*, *N. megalosiphon*, *N. tabacum* »White Burley« and *Phaseolus vulgaris* »Pinto«.

As the transmission experiments have shown, the isolate from *A. rivieri* had a very restricted host range among common test plants. This was in agreement with earlier transmission studies of DMV in Europe; whereas these studies in the USA gave negative results (Zettler et al. 1970, Zettler and Hartman 1986), reports from Europe showed that it was possible to isolate DMV to a narrow range of non-aroids. Rana et al. (1983) transmitted the virus to five ordinary test plants including *C. amaranticolor* and *C. quinoa*, and accoridng to A. A. Brunt, *T. expansa* is also susceptible to DMV (cf. Zettler and Hartman 1986). Our isolate from *A. rivieri*, like DMV, infected *C. amaranticolor* and *T. expansa* locally, but it failed to infect *C. quinoa*. This is perhaps a consequence of genetic properties of *C. quinoa* collection at our disposal, or a characteristic of the isolate itself.

In leaf squash preparations from the area of chlorotic lesions of *T. expansa* flexuous filamentous virus particles were detected (Fig. 1 D). The particles measured about 720—760 nm in length suggesting a potyvirus infection. Filamentous virus was also observed in ultrathin sectioned leaf tissue of the mother aroid *A. rivieri*. The particles were randomly

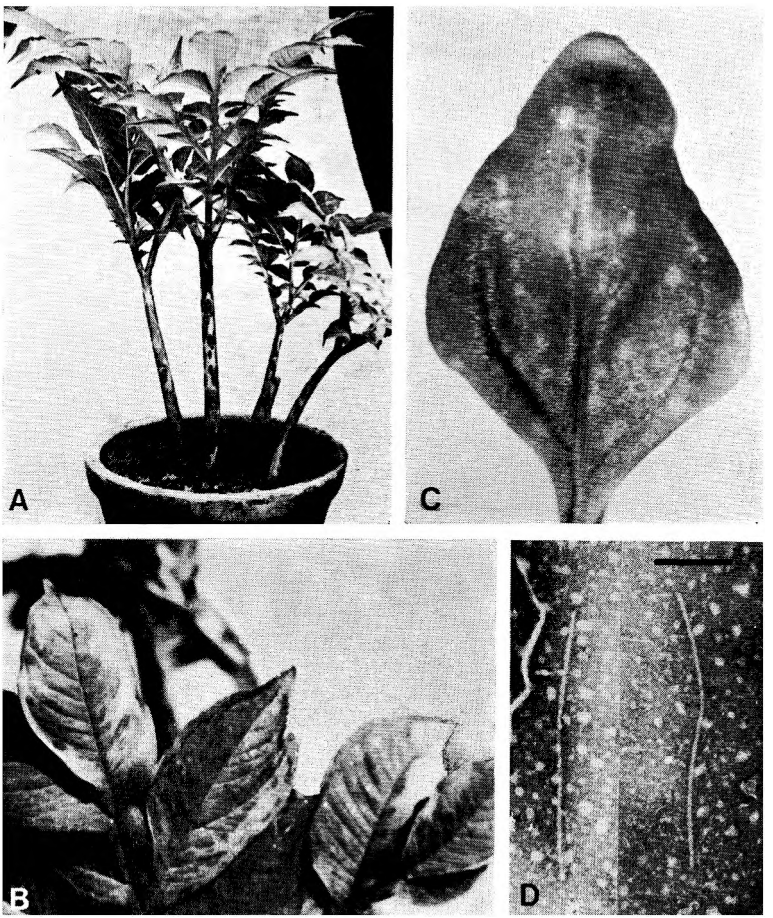

Fig. 1. A *Amorphophallus rivieri* plants without (left) and with virus symptoms (right). B Mottling and mosaic symptoms in the leaf of *A. rivieri* mother plant. C *Tetragonia expansa* with chlorotic local lesions provoked by potyvirus from *A. rivieri*. D Filamentous virus particles of the potyvirus isolate in squash preparation from local lesion area of *T. expansa*. *Bar* = *200 nm*.

scattered in the cytoplasm or they were in uniseriate rows adjacent to tonoplast (Fig. 2 A) and within cytoplasmic strands (Fig. 2 B). Such a regular arrangement of virus particles has been noticed up to now with many potyviruses (cf. Hollings and Brunt 1981, Francki at al. 1987).

In addition to uniseriate arrays of virions, cytoplasmic cylindrical inclusions were also present in infected cells of *A. rivieri*. Cylindrical inclusions showed pinwheel structures and scrolls (circular inclusions) (Fig. 3 A, B). The radiating plates of pinwheels were considerably curved, and the appearance of the pinwheels and scrolls corresponded entirely to those provoked by DMV (Zettler et al. 1970). Laminated aggregates, noticed earlier by DMV infection (Zettler et al. 1970), were not encountered most probably because of the restricted number of thin sections made.

The results of our investigations based on the host range reactions and cytopathic effect suggest that the potyvirus isolated from the aroid *A. rivieri* is very probably an isolate of DMV. However, serological examinations would be neccessary to prove its presence exactly. It seems that this paper is the first report about a virus infection of the araceous plant *A. rivieri*.

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SAŽETAK

ETIOLOGIJA VIRUSNE BOLESTI AROIDEJE *AMORPHOPHALLUS RIVIERI*

Nada Pleše, Gordana Horvat i *Mercedes Wrischer**

(Botanički zavod, Prirodoslovno-matematički fakultet Sveučilišta u Zagrebu i *Institut »Ruđer Bošković«, Zagreb)

Iz aroideje *Amorphophallus rivieri* Dur. s izražajnim mozaičnim simptomima i šarenilom listova izoliran je potyvirus. Na osnovi kruga domaćina i simptoma na pokusnim biljkama te citopatoloških promjena u stanicama zaražene aroideje zaključeno je da taj izolat vrlo vjerojatno pripada virusu mozaika kolokazije (dasheen mosaic virus). Čini se da je to prvi izvještaj o virusnoj infekciji te biljke iz porodice *Araceae*.

Prof. dr. Nada Pleše
Gordana Horvat, dipl. inž. biol.
Botanički zavod
Prirodoslovno-matematički fakultet
Maruličev trg 20/II
YU-41000 Zagreb (Jugoslavija)

Dr. Mercedes Wrischer
Institut »Ruđer Bošković«
Bijenička 54
YU-41000 Zagreb (Jugoslavija)