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A case of Arabis mosaic virus in carnations

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Abstract

A new disease in carnations, characterized by internode shortening and excessive lateral sprouting has been observed at a flower nursery. From plants with these symptoms, *Arabis* mosaic virus could be isolated by mechanical inoculation of *Chenopodium quinoa* with partially purified preparations or with crude sap to which some bentonite was added. Inoculation of healthy carnation plants with the isolated virus produced plants with the same symptoms. From these plants *Arabis* mosaic virus could be re-isolated. *Xiphinema diversicaudatum* (Micol.), vector of *Arabis* mosaic virus in the Netherlands, transmitted the virus to healthy carnation plants. The disease adds another species to the host range of *Arabis* mosaic virus, but is of no importance to the carnation industry.

Introduction

In May 1970, a disease unknown in carnations was brought to our attention. On a new flower nursery near Aalsmeer and situated on former grassland, some plants showed internode shortening with prolific lateral branching, giving the plants a bushy appearance (Fig. 1). Growth was markedly reduced and flowering extremely retarded or absent. The disease occurred in all cultivars of the nursery: 'William Sim', 'Crowley's Sim', 'White Sim' and 'Ann'. The diseased plants occurred in patches, except in the greenhouse with 'Crowley's Sim' where the diseased plants were evenly spread. This was the only one in which the soil had been steamed before planting. In the other greenhouses the soil had not been disinfected. In the following the authors describe the experiments performed to elucidate the cause of this disease.

Experiments

In May 1970, graftings were carried out onto healthy plants of the cultivar 'Joker'. In November, the newly-formed stems clearly showed the same symptoms as the 'White Sim' plants received. Control graftings of normal 'Joker' onto normal 'Joker' remained symptomless.

From diseased 'White Sim' plants, crude sap was prepared by grinding or homogenizing leaves in two or three times their weight of distilled water and squeezing the homogenate through cheese-cloth. From this sap partially purified virus preparations

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Fig. 1. *Arabis* mosaic virus in carnations: A, naturally infected 'White Sim'; B, artificially infected 'Joker' and C, healthy 'Joker'.

Fig. 1. Arabis-mozaïekvirus in anjer: A, langs natuurlijke weg besmette 'White Sim'; B, kunstmatig besmette 'Joker' en C, gezonde 'Joker'.

were made with acetone (Maat, 1965). Also a 1% bentonite suspension in distilled water was added to crude sap in a ratio of 1:5 or 1:9, with and without low-speed centrifuging. With all these preparations virus could be readily transmitted mechanically to *Chenopodium quinoa*. Serological tests with crude sap from *C. quinoa* plants showed the presence of *Arabis* mosaic virus (cryptogram R/1:*/41:S/S:S/Ne). Serologically the virus could not be detected directly in crude sap or partially purified preparations (purification with acetone) from carnations. The virus also could not be transmitted mechanically with crude carnation sap to *C. amaranticolor* or *C. quinoa* without addition of bentonite. From healthy carnation plants no virus was transmitted at all. From *C. quinoa* the virus was mechanically transmitted to *Nicotiana rustica*. The latter was then used as the virus source for inoculation of healthy carnation plants.

On 15 January 1971, two groups of 21 normal 'Joker' plants were inoculated

mechanically with different isolates of the virus. A third group remained uninoculated. The first symptoms of internode shortening and excessive lateral branching, accompanied by growth stunting appeared in May. In July, 13 of the 42 inoculated plants showed symptoms. The uninoculated control plants all remained symptomless. From the diseased plants, *Arabis* mosaic virus could be re-isolated.

As *Xiphinema diversicaudatum* (Micol.) is known to be a vector of *Arabis* mosaic virus in the Netherlands (van Dorst and van Hoof, 1965) soil from the greenhouse and from the grassland outside was elutriated for these nematodes. The samples contained 35 and 30 specimens, respectively, of the nematode *X. diversicaudatum* per 500 g of soil. To each of 5 pots planted with healthy *N. tabacum* 'White Burley', 20 of these nematodes (from the grassland soil) were added. Only in one pot did the plants become infected, indicating a low natural infection rate of the nematodes. From these test plants *Arabis* mosaic virus could be isolated. In another trial, groups of 20 nematodes (again from grassland soil) were added to 6 normal 'Joker' plants, one plant per group. Two plants became infected and proved to contain *Arabis* mosaic virus. Four plants, to each of which were added 20 nematodes from the greenhouse soil, remained healthy, as did 4 other plants without nematodes.

Discussion

To our knowledge this is the first case in which *Arabis* mosaic virus proved to be the cause of a disease in carnation, although carnation growing on unsterilized former grassland is not uncommon. Infection of cucumbers with *Arabis* mosaic virus on former grassland has been reported by van Dorst and van Hoof (1965). The carnation disease has not been found in cutting nurseries and is of no importance to the carnation industry. It was, however, of interest to the grower concerned and it adds another plant species to the host range of *Arabis* mosaic virus. The virus could not be isolated from carnation plants by mechanical inoculation of *C. quinoa* with crude sap as such. Partially purified preparations had to be used or bentonite had to be added to crude sap from diseased carnation plants for successful inoculation. Yarwood (1966), *i.a.*, reported earlier that bentonite may be helpful in the mechanical transmission of viruses.

At first the distribution pattern of the disease in the nursery was difficult to explain. However, the 'Crowley's Sim' carnation plants had been grown for some time in unsterilized soil before being transplanted to the greenhouse in which the soil had been steamed. That may be the reason why the diseased plants were evenly distributed throughout the greenhouse. The other varieties were planted in unsterilized soil without further transplantations. Here the disease became apparent in patches, undoubtedly because of localized distribution of virus-infected nematodes. In the experiments performed, no infection of carnation plants was obtained with nematodes from greenhouse soil. The reason for this may be a low infection rate as shown also for the nematodes from the grassland soil.

As a control measure killing of the nematodes before planting is advocated. However, this will only be important when the vector is present. This should be ascertained first by analysis of the soil.

Samenvatting

Een geval van Arabis-mozaïekvirus in anjers

Op een nieuw anjerbedrijf in de omgeving van Aalsmeer werd een tot nu toe onbekende ziekte waargenomen, die gekenmerkt werd door verkorting van de internodiën, overmatig uitlopen van zijscheuten, gedrongen groei en vertraagde of zelfs volledig uitblijvende bloei (Fig. 1). Uit planten met deze symptomen kon *Arabis*-mozaïekvirus worden geïsoleerd. Inoculatie van normale anjerplanten met dit virus uit anjer leverde planten op met dezelfde symptomen. Ook deze anjerplanten bleken *Arabis*-mozaïekvirus te bevatten. *Xiphinema diversicaudatum*, gehaald uit grasland buiten de kassen, bracht het virus over naar gezonde anjerplanten. De ziekte is van geen belang voor de anjerteelt als geheel. Het verrichte onderzoek voegt een plantesoort toe aan de toch al grote waardplantenreeks van het *Arabis*-mozaïekvirus.

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