

Arabis mosaic virus in tulips

C. J. ASJES

Bulb Research Centre, Lisse

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Soil-borne *Arabis* mosaic virus (AMV), which occurs naturally in various wild and cultivated plants (Murant, 1970), has also been found in ornamental bulbous crops, such as tulip, narcissus, hyacinth, crocus, and lily (Asjes, 1974). This paper now briefly reports on the symptoms associated with the incidental occurrence of AMV in primarily and secondarily infected tulips and on the diagnosis and control of infection.

Symptoms on field plants. The symptoms observed in tulip varied. At the end of the 1971 season, plants of 'Rose Copland' in patches in the field were brittle, dwarfed and twisted, and died prematurely. Many oval grey or occasionally brown necrotic ringspots of varying size (Fig. 1) were present, mainly near the base of the lower leaves. Sunken oval brown necrotic lesions occurred on the sub-soil part of the stem and were greater in number near the tip of the bulbs, both on plants with severely diseased and on others with apparently healthy leaves. The roots showed necrotic lesions. The symptoms on the stems and the roots were likely to be attributed to nematode damage.

In 1972, only a few plants of originally healthy 'Rose Copland' showed short necrotic streaks on the upper leaves on the same field as in 1971. All other plants, also of other cultivars, showed no symptoms except those on the sub-soil stem region.

In 1974, in a patch in another field a few plants of 'Rose Copland' were stunted with twisted leaves and stems, but without the other leaf symptoms. The sub-soil stem region showed lesions. On plants growing nearby only sub-soil symptoms were observed.

All bulbs of 'Rose Copland' and other cultivars, including bulbs evidently infected, replanted in the field in various years gave symptom-free plants.

Symptoms of forced tulips. Characteristic symptoms were not found on 'Rose Copland' plants forced in winter under conditions favourable for the development of tulip veinal streak (Asjes and Muller, 1973), a disease probably due to tobacco ringspot virus (Asjes, 1972), another NEPO-virus. The repeatedly observed absence of symptoms of AMV is in conflict with Brunt and Jenkins' (1970) report on 'Rose Copland' showing leaf chlorosis, severe yellow streaking and some necrosis in stunted plants with unsaleable flowers. In my observations only once in plants of 'Comet' forced in 1970 symptoms consisting of necrotic streaks on the basal parts of



Fig. 1. Grey and brown necrotic ringspots of varying size on basal part of tulip leaf.

Fig. 1. Grijs- en bruinkeurde necrotische kringvlekken van verschillende grootte op basale gedeelte van tulpeblad.

the upper leaves mainly were detected. The flowers showed oval spots and a slight colour breaking.

AMV detection in tulips. In field and glasshouse tulips AMV was diagnosed by sap inoculation onto *Chenopodium quinoa* and *Nicotiana tabacum* 'White Burley' and by serological testing of the resulting infections. The sap of flowers was suitable for direct sap transmission, and a partial purification procedure with butanol/chloroform (Asjes, 1972) was applied to obtain the virus from the leaves. From greenhouse plants the AMV was readily transmissible, whereas it was difficult to be obtained from field plants.

Symptoms were reproduced in originally healthy plants by replanting of bulbs in AMV-infested soil.

Soil sampling for nematodes. In 1971, 200-ml samples taken from the light clay soil of the field with symptoms in 'Rose Copland' proved to have 200–500 *Xiphinema* nematodes per sample (C.N. Silver, Plant Protection Service, Wageningen, personal

communication). In 1972, the soil samples from the same field on average had less than 100 nematodes. In 1974, the light loamy soil of the plots with stunted 'Rose Copland' plants contained more *Xiphinema diversicaudatum* nematodes than nearby plots with symptom-free plants.

AMV-control in the field. The preventive effect of late planting (November/December) on tobacco rattle virus infection of tulips (Asjes, 1974) does not hold for AMV. Samples of tulips forced under glass after having been planted in AMV-infested soil on September 15, October 15, November 15, and December 15, showed in 24–30 plants 78, 39, 50, and 46% AMV infection, respectively.

AMV is hard to control because of the probable absence of symptoms in plants infected from the soil except for necrotic lesions on stems and roots, and stunted growth. Plants developing from infected bulbs of many cultivars are healthy in appearance and this impedes the tracing of infected stocks in the field. In addition, a high proportion (60%) of the tulips in the Netherlands are planted in heavy loam and light clay soil, which cannot be properly treated with soil desinfectants, such as dichloropropane/dichloropropene mixtures, when the presence of AMV-carrying nematodes is suspected.

Samenvatting

Arabis-mozaïekvirus in tulpen

Uit tulpen werd incidenteel het *Arabis-mozaïekvirus* (AMV) geïsoleerd. Te velde pleksgewijs voorkomende planten van 'Rose Copland' voelden bros aan, vertoonden een verwrongen stand, waren kleiner en lieten grijs- en bruingekleurde ovale kringvlekken zien op de bladeren (Fig. 1). Op het ondergrondse deel van de tulpestengel waren ingezonken, ovale, bruingekleurde kringvlekken zichtbaar, die waarschijnlijk door het steken van de nematoden werden veroorzaakt. Op tulpen die in de kas tot bloei werden gebracht, en bij de nateelt te velde van bollen geoogst van zieke planten, werden geen symptomen waargenomen.

In de grond, waarop de pleksgewijze aantasting van tulpen zich voordeed, werd het voorkomen van grote aantallen *Xiphinema*-nematoden vastgesteld. Het laat in het seizoen (november/december) opplanten van bollen te velde had geen invloed op het infectiepercentage.

References

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Address

Laboratorium voor Bloembollenonderzoek, Heereweg 345a, Lisse, the Netherlands.