Viruses and virus diseases in Dutch bulbous irises (Iris hollandica) in the Netherlands

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Accepted 3 August 1979

Abstract

The occurrence in Dutch bulbous irises (Iris hollandica) of two viruses – iris mild mosaic virus (IMMV) and iris severe mosaic virus (ISMV) – in association with two diseases – mosaic (mozaiek) and grey (grijs) – was reported so far. In the Netherlands, three virus diseases have been distinguished: mild mosaic (mozaiek), mild yellow mosaic (bont), and severe mosaic (grijs). These diseases were associated with IMMV (750 nm), IMMV plus iris mild yellow mosaic virus (IMYMV, a newly recognized virus; 660 nm), and IMMV plus ISMV (750 nm), respectively. The viruses are antigenically distinct and their presence could be established serologically. Tobacco mosaic virus (TMV), tobacco rattle virus (TRV), and tobacco ringspot virus (TRSV) were also detected in irises, but not in association with particular symptoms.

Generally, the symptoms of the diseases can be distinguished early in the growing season, particularly in March. Later on, the distinctive symptoms mostly disappear on plants showing mild symptoms but not on severely affected plants. Growing and forcing conditions influence the symptoms. The IMYMV and the ISMV transmitted in May and early in June by Macrosiphum euphorbiae cause more severe symptoms than those induced by transmissions late in June and in July. Problems related to disease control in irises are discussed.

Additional keywords: iris mild mosaic virus, iris mild yellow mosaic virus, iris severe mosaic virus, Macrosiphum euphorbiae, tobacco mosaic virus, tobacco rattle virus, tobacco ringspot virus.

Introduction

In the Netherlands the acreage of Dutch bulbous iris (Iris hollandica) is about 2000. The irises are grown on loamy and sandy soils. They are planted in the field in October/November and harvested in July/August of the following year. Vegetative propagation facilitates and includes virus transmission to progeny bulbs. Virus infection may decrease commercial value of the bulbs of many cultivars when these are used for forcing into flowering during various periods throughout the year (Durieux and De Pagter, 1967).

Till now symptomatology and etiology of virus diseases of Dutch bulbous irises have been confusing due to lack of information on the viruses known to be involved so far. Iris mild mosaic virus (IMMV) and iris severe mosaic virus (ISMV) have long been known to occur in Dutch bulbous irises in the Netherlands (Van Slogteren, 1958; 1963). IMMV occurs in all cultivars grown commercially (Van Slogteren, 1958). In my own investigations of the crop, I have come across a number of other viruses, as
tentatively reported: iris mild yellow mosaic virus (IMYMV; Dutch name: irisbontvirus; Asjes, 1974a), tobacco mosaic virus (TMV), tobacco ringspot virus (TRSV; Asjes, 1969) and tobacco rattle virus (TRV; Asjes, 1974b). The present paper reports in more detail on the occurrence of these viruses in Dutch bulbous irises, their symptoms, particularly in view of field diagnosis, transmission by aphids and control measures applicable in irises in the Netherlands.

Materials and methods

Virus disease survey. Samples of several iris cultivars showing virus syndromes were available for investigation. They were sent by growers and by inspectors, or collected in the field by myself.

Virus symptom expression. In order to describe symptoms and to study their variations more reliably, stocks of ‘Dominator’, ‘Ideal’, ‘Professor Blaauw’, and ‘Wedgwood’, which upon testing had been found naturally infected by IMMV, IMYMV, and occasionally ISMV, were grown in the field on light sandy, peaty bog, and heavy loam soils. The bulbs were replanted in sandy soil and re-examined for symptom expression in the following growing season.

In addition, similar stocks of ‘Dominator’, ‘Professor Blaauw’, ‘Wedgwood’ planted in sandy, peaty bog, and heavy loam soils were given the usual temperature treatments and forced into flowering in February/March at 13–15 °C under glass. The severity of symptoms of IMMV and IMYMV on plants of ‘Professor Blaauw’ in sandy soil was evaluated in sequentially forced samples throughout the year (Durieux and De Pagter, 1967).

Electron microscopy. Leaf epidermal strips of ‘Dominator’, ‘Professor Blaauw’, and ‘Wedgwood’ were macerated in phosphate buffer (0.067M; pH 7.2) and the extracts treated with 2% phosphotungstic acid (pH 7.2). TMV was added as an internal standard (Bos, 1975) or as an external standard when photographs on separate grids were taken intermittently. The virus particles photographed at a magnification of 10000 in a Philips 201S electron microscope were enlarged by projection to approximately 200000, the images drawn on paper, and measured.

Purification of viruses. The leaves of plants of various cultivars containing IMMV, plus ISMV, or IMYMV, or TMV, or TRV, or TRSV, were homogenized with an Ultraturrax in NaK-phosphate buffer (0.067M; pH 7.2; w/v = 1/1) containing 0.1% thioglycollic acid, or in 0.2M boric acid plus 0.05M sodium borate (pH 7.2; w/v = 1/1). The extract, which was used directly or after freezing at −20 °C for at least a day, was treated with n-butanol/chloroform (w/v = 1/1; 1/2h) and the virus in the aqueous phase differentially centrifuged (Asjes, 1972). The viruscontaining pellet was resuspended in the phosphate or borate buffer.

Antisera. IMMV antiserum had earlier been prepared with partially purified virus preparations from apparently healthy iris plants ‘Albino’ (Van Slogteren, 1955), and ISMV antiserum from mosaic showing material of crocus ‘King of the Blues’ (Van Slogteren, 1958). Antiserum against TRSV, and similarly against TRV, were prepared by

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