Neth. J. Pl. Path. 79 (1973) 81-84 SHORT COMMUNICATION

The spread of carnation mottle virus in carnations in glasshouses

R. ZANDVOORT

Plant Protection Service (PD), Wageningen

Accepted 29 December 1972

Carnation mottle virus (R/1:*/(20):S/S:S/*) is widespread in carnations, *Dianthus caryophyllus* L. In the last decennia, however, carnation plants of several cultivars have been freed from the most important viruses such as carnation ringspot and mottle virus by means of meristem tip-culture.

In experiments of Hakkaart (1964), Hollings and Stone (1964) and Paludan and Rehnstrøm (1968), reinfection of 'virus-free' crops with carnation mottle virus was moderate, though this virus is highly infectious. Since more information about the spread of mottle virus in carnations at florist's nurseries is desirable, it was decided to carry out the experiments reported below.

During the winter of 1965/66 pilot experiments were conducted. When the collected data for the spread of carnation mottle virus are graphically plotted against time, the progress of reinfection looks like an S-shaped curve.

In order to obtain more information, the experiment was continued in 1968 at eight florist's nurseries by sampling plots of 100 plants. Seven plots were planted with the cultivar 'White Sim' and one with the cultivar 'William Sim'. The young plants, all supplied by the same grower, were first sampled a short time after pinching and then approximately every 40 days thereafter. To avoid virus transmission by hand during sampling, each sample was collected with a separate new plastic bag. In the laboratory the samples were tested serologically for the presence of carnation mottle virus by gel double diffusion.

The data obtained are graphically plotted against time. In Fig. 1 the broken curve at the left is representative for 2 plots (group A) and the broken curve on the right for 6 other plots (group B). Especially the curve on the left suggests that the spread of carnation mottle virus can be graphically plotted as an S-shaped curve. Van der Plank (1963) has proved that the progress of an epidemic disease can be plotted by straight lines after logit-transformation, using the formula $\frac{1}{2}$ ln x/(1–x) (x = proportion of virus-infected plants). By plotting the logits of our observations against time, reasonably straight lines can be fitted to the points.

Though the plots were planted in the same period, the figures show a much earlier increase of the number of virus-infected plants of group A than in the plots of group B. The retarded spread of carnation mottle virus is more clearly demonstrated in Fig. 2, representing the regression-lines of the different plots.

The striking difference between the groups of plots is the absence in group B of beds with carnations completely infected with carnation mottle virus in the same

Fig. 1. The increase of the percentage virus-infected plants with time in one plot representative for group A (left) and in one plot representative for group B (right) and the straight lines after logit-transformation.

Fig. 1. Verloop van het percentage door virus aangetaste planten uitgezet tegen de tijd in een veldje uit groep A en een veldje uit groep B en de rechte lijnen na transformatie.

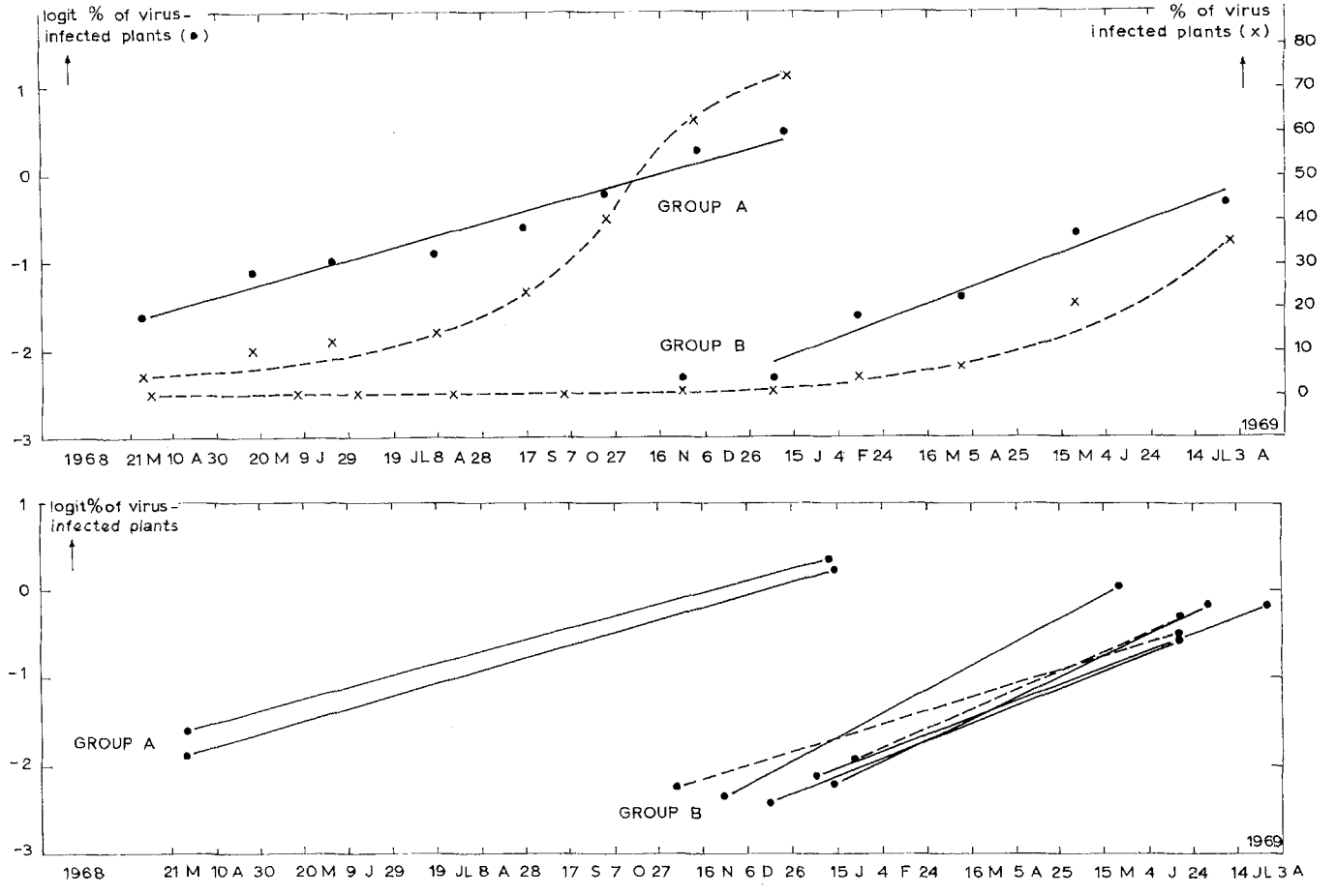

Fig. 2. The regression-lines of the plots of group A and group B.

Fig. 2. De regressielijnen van de proefveldjes uit groep A en groep B.

glasshouse section. It was surprising, nevertheless, that the gradient was very different among members of group B. Besides the degree of infection of the different beds of plants in the same glasshouse section, there must have been one or more unknown factors of importance for the spread of carnation mottle virus.
The following conclusions were drawn:

1. The disease-progress of carnation mottle virus can, like other epidemic diseases, most likely be graphically plotted as an S-shaped curve and straight lines can be fitted to the points after logit-transformation.
2. The increase of the number of infected plants started later if beds with carnations completely infected with carnation mottle virus were absent in the same section of the glasshouse.
3. The differences between the gradient of the regression-lines suggests that besides the degree of infection, there must be other factors of importance for the spread of virus.

Acknowledgment

The technical assistance of Miss W. A. E. Röthengatter and Mr H. N. Cevat and Mr D. L. J. Dijkstra are gratefully acknowledged. The author wishes to thank Dr J. J. Butler, Groningen, for correcting the English text.

Samenvatting

Verspreiding van anjervlekkenvirus bij anjer

Op een aantal bedrijven werd in een bed anjers – nateelt van 'virusvrij' gemaakte planten – een veldje van 100 planten enkele malen bemonsterd. De virusverspreiding werd bij het bemonsteren voorkomen door bij het plukken van elke spruit een nieuw plastic zakje te gebruiken. De monsters werden in het laboratorium serologisch onderzocht. De verkregen resultaten van twee representatieve proeven zijn weergegeven in Fig. 1. Uit deze grafiek blijkt dat, evenals bij vele andere ziekten, de verspreiding van het anjervlekkenvirus grafisch kan worden weergegeven door een S-vormige lijn en dat er nagenoeg rechte lijnen ontstaan na een logit-transformatie.

In Fig. 2 zijn de regressielijnen voor de afzonderlijke veldjes weergegeven, waaruit blijkt, dat de proeven in twee groepen kunnen worden verdeeld. De verdeling hangt samen met het al (groep A) of niet (groep B) aanwezig zijn van volledig viruszieke partijen elders in de kas. Daarnaast zijn nog andere factoren van betekenis.

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Present address

Instituut voor Biologisch en Scheikundig Onderzoek van Landbouwgewassen, Postbus 14, Wageningen, the Netherlands.

Book review

C. M. Messiaen & R. Lafon: Les maladies des plantes maraichères (Diseases of vegetable crops); 2nd Edition. Publ. 6–70, 441 pp, 123 figs. Institut National de la Recherche Agronomique, Paris 1971. Price NF 64.50.

The first edition of this book was published in two volumes in 1963. Since then, many studies have appeared on the subjects treated by the authors, especially on mechanisms and types of resistance. Because of the recent increase of the application of systemic fungicides moreover required a revision of the measures for disease control also became necessary.

This second edition has been published as one volume. The design is the same as that of the edition of 1963, but the authors present more background information, especially on disease control and they include the most recent fungicides in their advice for chemical control. Through the entire volume the reader is provided with up-to-date information on the various subjects, presented both clearly and carefully.

The first chapter deals with the determination of diseases on vegetables. A survey has been given of pathogenic fungi and bacteria with emphasis on the plant diseases they cause. A concise treatment of the transmission of viruses and mycoplasmas and the symptoms they cause has been presented. The second chapter deals with disease control in horticulture. Special attention is paid to disinfestation of soil either by steaming or by fumigants. Tables give details on effectiveness of various fungicides and on compatibility of mixtures of biocides.

The main part of the volume, viz. thirteen chapters (c. 300 pages), is devoted to the diseases of vegetable crops, grown in France and the mediterranean countries, with special emphasis on diseases of tomato, Cucurbitaceae, bean, lettuce, onion, garlic and leek. Each chapter contains notes on cultivation, a description of the various diseases, and of the circumstances favouring their development. Differences in symptoms and pathogens have clearly been described, often well illustrated with photographs or schematic drawings. When known, control measures are described in detail. Especially soilborne and vascular wilt diseases receive much attention. Nematodes and other plant parasitic animals are only included insofar as they give symptoms similar to those caused by fungi and bacteria or when they transmit viruses, bacteria and fungal spores.

References, in total about 33 pages, are listed at the end of each chapter. They are well selected, only the most pertinent and especially the recent references being given. In the text there is little reference to the sources even when recently acquired data are cited. This promotes legibility, but sometimes it might be felt as a disadvantage. For instance it is reported that after soil steaming the *Mortierella* spp. increase because of their heat-resistance, but much time is needed to find out from which literature this observation has been taken.

References in the text by numbers in parenthesis would have facilitated this, without reducing legibility.

The mycological repertory contains a description of the morphological characters and often of the isolation procedures of all pathogenic fungi mentioned in the volume. These descriptions would have been clearer if simple line drawings of characteristic structures (e.g. spores, sporocarps) had been given or if reference had been made to figures elsewhere in the book.

This handbook in which much experience and recent information is so clearly and accurately presented, is not only indispensable for well-informed growers and advisory officers, but also for phytopathologists working on vegetable crops.

A translation in English is eagerly awaited.

G. J. Bollen