VIRUS INFECTION IN SOUTH AMERICAN POTATOES

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Summary, Zusammenfassung, Résumé, p. 150

1. INTRODUCTION

Expeditions from the John Innes Institute visited South America in 1959/60 and in 1963 (John Innes Institute, 1961a, 1964) and collected, in all, some 800 Solanum tuber samples for the Commonwealth Potato Collection from a wide range of localities. The 1959/60 expedition concentrated on cultivated diploid potatoes though tetraploids and some triploids were also collected; in 1963, samples of wild and weed species associated with potato cultivation were taken, as well as cultivars.

Potato tubers may be brought into Great Britain only if a quarantine licence has been issued by the Ministry of Agriculture, Fisheries and Food who must be notified of the details of origin, etc. of each imported sample. These licences require that precautions be taken to avoid release of any diseased, especially virus-infected, material, and stipulate that the imported plants be grown in an insect-proofed glasshouse until their state of health can be determined. After a certain period, lines in which there is no evidence of infection may be released from quarantine by the Ministry and may then be grown outside but official policy is to restrict the distribution of imported experimental material as much as possible as a precaution against the dispersal of any diseased clones which have not been recognized as infected. Diseased lines are usually destroyed but an infected line of especial interest may be retained for a further period in quarantine if it has been shown to contain only viruses already established in this country.

This paper describes the procedure used to check the health of introductions to the Commonwealth Potato Collection and records the extent and nature of virus infection in samples recently received from different areas of South America. Such data give some indication of the incidence in South America of the common potato virus diseases but it must be stressed that the samples were not selected to provide information on virus infection and, in this respect, may well be unrepresentative of the crop in the area where they were collected. Some samples were definitely unrepresentative; for example, many of those from Chile were taken from varietal collections in which the level of infection is probably higher than in ordinary cultivations.

The quarantine licences which referred to these importations required specifically that White Burley tobacco plants should be inoculated with sap from each introduction and that the inoculated tobacco be examined for infection. However, some viruses which infect potato are not mechanically transmissible or do not infect tobacco and these would remain undetected unless the symptoms of infection were evident in the introduced plant. Detection of infection by visual symptoms is often difficult even in...
cultivars whose healthy appearance is familiar and is even more difficult when there is
only a single specimen of each clone which must be classed as healthy or diseased.
Moreover, it is not always possible to identify those viruses that do infect tobacco by
their symptoms on that plant alone. Further tests were therefore made which, it was
hoped, would detect and identify at least the more common potato viruses when pre-
sent alone or in association with others.

2. METHODS
Methods were generally similar to those of Cockerham, Davidson and MacArthur
(1963).

The presence or absence of potato viruses X and Y was indicated by the reaction of
the inoculated tobacco and was confirmed for PVX by a serological test on expressed
sap. Potato plants in which the presence of PVY was indicated by the tobacco test
were tested also by sap inoculation onto two lines of Solanum demissum, one of which
reacted hypersensitively to PVA, the other to both PVA and PVY, thus enabling these
viruses to be distinguished. It may be noted that some strains of PVA are symptomless
on tobacco and that infection by them would remain undetected unless they caused
visible symptoms on the introduction. Mixed infection with PVX and PVY gave veinal
necrosis on tobacco but some isolates of PVY gave these symptoms on their own and
were recorded separately as TVN (tobacco veinal-necrosis strain of PVY).

Serological tests for potato viruses S and M were made with an antiserum which
reacted with both viruses (Kassanis, 1960). Detection of the leaf-roll virus presented a
more difficult problem, except in plants showing clear symptoms of infection. Scions
from many of the introductions were grafted onto stocks of the variety Arran Victory
but the leaf-roll reaction was often indecisive, even in second-year plants grown from
tubers harvested from the original grafted stocks. Arran Victory is top-necrotic to
Group 2 strains of PVX (Cockerham, 1955) and the presence of such strains was indi-
cated by a positive reaction which, however, prevented assessment of leaf-roll infec-
tion.

Finally, introductions, which appeared to be virus-infected but which gave aberrant
reactions or none in the tests described, were sap-inoculated onto Chenopodium amar-
anticolor (Hollings, 1956); in a few cases, symptoms developed which indicated the
presence of viruses which were recorded as "unidentified".

3. RESULTS
The numbers of samples tested from different areas and the proportions in which the
different viruses were detected are recorded in Table 1. As noted above, the two sets of
samples differed in that those collected in 1963 included a proportion of "wild" and
"weed" species and hence are considered separately.

The level of infection in the 1959/60 samples, as indicated by the number of plants
in which any virus was detected, ranged from 49% in Columbia to 92% in Chile. In-
cidence of PVX was highest in Bolivia (50%) but surprisingly low in Colombia (2.7%).