Ibid., Garagnani F., Costa, G., Venturelli R. —Osservazioni sulla resistenza della cultivar di fragola alle gelate primaverili. Rivista Ortoflorofrutticoltura Italiana, 4, 1968.

Branzanti, E. C.—Ricerche sulla fragola. 7) Contributo allo studio delle cultivar rifiorenti.—Congresso Nazionale della fragola, Verona 14 giugno, 1964.

Ibid., Rosati P.—Nuove pregevoli cultivar di fragola. Italia Agricola, 12, 1967.

Ibid, Bazzocchi R.—Alcune interessanti cultivar di fragola rifiorenti. Frutticoltura, 6-7, 1969.

Trees of 200-Year Old Newtown Apple Cultivar Found Free of Commonly-Occurring Viruses

F. WELSH AND JAMES MAY*

The means by which viruses are disseminated must usually be determined by planned experiment. However it is often possible to gain knowledge of the patterns of spread, and the extent of such spread, by orchard surveys and by sample indexing of trees in commercial plantings. The rate at which new cultivars become infected provides useful evidence. The persistence of freedom from virus infection in older cultivars has comparable significance.

A recent determination that two trees of Newtown apple are free from detectable virus infection, offers interesting circumstantial evidence that orchard spread of viruses in apple must be uncommon, because this cultivar has been commercially grown in North America for more than 200 years.

Orchard surveys in Europe (3) have shown that the proliferation disease spreads at appreciable rates. Several workers have demonstrated that viruses spread between adjacent trees in orchards by natural root grafting (5). We have encountered such spread in experimental plantings at Summerland. We are aware of no planned experiments or survey data in North America that have provided conclusive evidence of tree-to-tree spread by means other than root grafting. Only two viruses, tobacco mosaic virus (4) and tomato bushy stunt virus (1) have been experimentally transmitted through apple seeds.

Nevertheless, some indications of natural spread of viruses in apple plantings have been recorded (5). Moreover, the results of apple virus indexing in most countries where such indexing has been conducted, have demonstrated high levels of incidence of viruses such as those causing stem pitting, rubbery wood, chlorotic leaf spot, apple mosaic, Spy epinasty and brown line decline (stem grooving). At Summerland, in an indexing program designed to identify clean clones of commercial cultivars and hardy frameworks, over 75 percent of all clones indexed have proved to be infected, most of them with two or more viruses. Almost invariably, the cultivars that are free from infection have been relatively recent products of breeding programs (e.g. Haralson, Jubilee, 0-271, 0-292, Spartan, Stirling, Summerred) for which budwood has been available from the original seedling or from first propagations. Among improved "strains" of standard cultivars originating in the United States and Canada as red or spur sports, all those tested are infected with three or

*Research Plant Pathologist and Technician respectively, Canada Department of Agriculture, Research Station, Summerland, B. C., Canada.

more viruses (usually including rubbery wood virus) except Starkrimson Delicious, which gives negative reactions on all indicators. These results have suggested that dissemination of viruses is relatively efficient, and have favored an assumption that some form of orchard spread is involved.

Such an assumption looses a measure of justification with the recent demonstration that two Newtown trees in a British Columbia orchard are free from detectable virus infection.

Newtown trees were selected for indexing in two orchards in which the trees were vigorous, and as free as possible from any symptoms that might be virus-induced. In particular, incidence of the virus disease, Newtown ring russeting, was lower in these orchards than in any other surveyed Newtown plantings in the region. The two selected trees in one orchard gave positive reactions for chlorotic leaf spot, stem pitting and Spy epinasty viruses. The two trees selected in the second orchard have failed to induce reactions on the indicators, Russian apple R12740-7A, Jay Darling, Virginia Crab, Lord Lambourne and Spy 227, indicating that these trees are free from infection with chlorotic leaf spot, stem pitting, brown line decline (stem grooving), rubbery wood, chat fruit, apple mosaic and Spy epinasty viruses. Indexing for flat limb virus is incomplete, but as this virus is reported to occur rarely without rubbery wood virus demonstration of its presence is not anticipated.

Newtown (Newtown Pippin, Yellow Newtown, Green Newtown, Albemarle Pippin) is one of the oldest apple cultivars still grown commercially in North America. It is believed to have originated early in the 18th century on Long Island in New York State (2). Fruit were sent to Benjamin Franklin during his London sojourn, in 1759. Substantial commercial shipments of the variety were being made in 1773. The two indexed trees in British Columbia were planted in 1935. Thus, at the time they were planted, the cultivar was already more than 200 years old. It is remarkable that, in such a long period, any cultivar could have escaped infection by natural root grafting, or by grafting to infected clones. It seems highly unlikely that it would have maintained its freedom from virus infection if natural spread of viruses by means other than root grafting occurs with any frequency in apple plantings.

Literature Cited

1. Allen, W. R. 1969. Occurrence and seed transmission of tomato bushy stunt virus in apple. Can. J. Plant Science 49: 797-799.
2. Beach, S. A. 1905. The apples of New York. Report of the New York Agric. Exper. Sta. for the Year 1903. 1:145-150.
3. Bovey, R. 1963. Observations and experiments on apple proliferation disease. Proc. 5th Europ. Symp. Fruit Tree Virus Dis. in Phytopath. Medit. 2: 111-114.
4. Gilmer, R. M. and J. M. Wilks. 1967. Seed transmission of tobacco mosaic virus in apple and pear. Phytopathology 57: 214-217.
5. Welsh, Maurice F., Frederick W. L. Keane and James May. 1963. Apple virus diseases in British Columbia, evidence of natural spread. Proc. 5th Europ. Symp. Fruit Tree Virus Dis. in Phytopath. Medit. 2: 150-152.

A.P.S. will meet informally during the A. S. H. S. meetings in Miami Beach, Nov. 2-4, mainly to bring interested members up-to-date. More information will come later.

It would be appreciated if authors would, in preparing titles for manuscripts, follow more closely the format actually used in the Digest.

—*G. M. Kessler*