Spread of Citrus Mosaic through Distribution of a New Clone of Satsuma Mandarin

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Citrus mosaic was first described as a virus disease by Ishigai and Jinno (1958) after long recognition as an unknown fruit disorder. The characteristic symptom is a green and yellow mosaic on the rind of the fruit at color break (fig. 1). The causal agent, citrus mosaic virus (CiMV), is considered closely related to Satsuma dwarf virus (SDV) in its herbaceous host range, particle shape, and serological relationships (Imada *et al.*, 1977; Tanaka and Imada, 1974, 1976).

Citrus mosaic was restricted to the Arita district of Wakayama prefecture for a long time. A survey in 1958 found 30 ha infected in Wakayama pefecture. However, the situation has changed recently. Miyamoto-wase was derived from a bud mutation of Miyagawa-wase in Wakayama prefecture, and was shown to be superior in qualities such as earlier ripening, color, and sweetness. Therefore, new plantings of this clone are increasing in and outside of Wakayama prefecture. Some growers propagate new clones by topworking old satsuma mandarin trees. Citrus mosaic-infected Miyamoto-wase fruit was discovered in some areas. Because the original clone of Miyamoto-wase does not contain CiMV, infection of the new clone must have resulted from topworking new scions on old, infected satsuma mandarins.

The prefectural government surveyed the distribution of the virus within Miyamoto-wase trees by indexing on sesame (table 1). Of 2,808 trees tested, 195 were infected with CiMV. The prefectural government then started a certification program, including thermotherapy, of infected plants and designation of virus-free mother trees.

Soil transmission of CiMV is also suggested as with SDV (table 2). When 2-year-old satsuma mandarin trees were planted in infested soil, diseased plants appeared after 7 years. The rate of dissemination is not fast, and the distribution of diseased fruit within a tree is erratic. Although soil transmission of

Fig. 1. Citrus mosaic-infected fruits. Top, satsuma mandarin; bottom, Kinkoji.

CiMV is not yet conclusive, the spread of the disease may accelerate. The prefectural government is considering extending the survey to citrus plants other than Miyamoto-wase to prevent further spread of the disease.

TABLE 1
SURVEY OF CITRUS MOSAIC IN MIYAMOTO-WASE SATSUMA MANDARIN TREES BY INOCULATION OF SESAME PLANTS IN WAKAYAMA PREFECTURE, JAPAN (1978)

Extension Center	No. of trees tested	No. of trees infected	Per cent infection
Arita	150	9	6.0
Hidaka	115	13	11.3
Ito	515	30	5.8
Naga	1,563	82	5.2
Nishimuro	250	27	10.8
Wakayama	215	34	15.8
Total	2,808	195	Avg. 6.9

TABLE 2
INFECTION OF SATSUMA MANDARIN TREES PLANTED IN CITRUS MOSAIC-INFESTED SOIL*

Year	No. trees with fruit symptoms/total trees
1959	0/12
1964	0/12
1966	4/12
1967	3/12

*Trees planted in 1959.

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