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International Organization of Citrus Virologists Conference Proceedings (1957-2010)

Title

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Permalink

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Journal

International Organization of Citrus Virologists Conference Proceedings (1957-2010), 11(11)

ISSN

2313-5123

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Publication Date

1991

DOI

10.5070/C59rc2r0qw

Peer reviewed

A Report of Preinoculation to Control Stem Pitting Disease of Navel Orange in Fields Up to 1989

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ABSTRACT. Selected sources of mild CTV and vein enation virus (CVEV) for cross protection against severe CTV have been evaluated on Morita Navel on trifoliolate orange rootstock trees in the field. Observations up to 1989 showed that preinoculation of mild CTV M-15A and M16A provided vigorous growth and setting of large-sized fruit. In other trials, trees preinoculated with source No. 145, which does not react with polyclonal CTV-antisera, and with CVEV No. 1605 grew very well. *Index words.* Cross protection, citrus, tristeza virus.

A survey of mild strains of tristeza virus (3) and the indexing of them for cross protection against severe strains of CTV (1, 2, 3) have been reported. This paper deals with field trials of preinoculation with those selected mild sources at Okitsu Branch and Kuchinosu Branch, Fruit Tree Research Station (FTRS) up to the present.

MATERIALS AND METHODS

Field trials at Okitsu Branch. CTV-free Morita Navel orange on trifoliolate orange (TRF) rootstock trees were used. Mild CTV M-8 and M-10 were obtained by tissue grafting from healthy trees of pummelo and Hassaku planted in the field (1). Mild CTV M-15A was isolated by *Toxoptera citricidus* Kirk. from a CTV-infected sour orange tree to a Mexican lime seedling. Mild CTV M-16A and vein enation virus (CVEV) V-16A were obtained by the similar methods from a citrus hybrid tree which was naturally infected with mild CTV and CVEV. Mild CTV M-23 and M-24 were obtained by tissue grafting from a heat treated Morita Navel orange tree which had been infected with a seedling yellows CTV (CTV-SY, S-5). Mild CTV M-23A was isolated by aphid transmission from M-23.

Preinoculated trees were propagated on TRF rootstocks after confirmation of CTV-infection by ELISA 2.5-3 months after the inoculation. About half of the propagated trees were challenge-inoculated with CTV-

SY (S-5) using aphid transmission in 1981-1983 (1).

Challenge-inoculated trees and the others were kept in a screen house for one year and then put outdoors, followed by the transplanting to the field in April 1987. After being planted out, all of the trees were exposed to natural transmission of CTV.

Field trial at Kuchinotsu Branch. Virus free Morita Navel orange and Yoshida Navel orange on TRF rootstock trees were used. Preinoculation source No. 145 was collected by tissue grafting from a pummelo seedling tree at Kuchinotsu in 1976, and showed negative reactions on Mexican lime and to ELISA using polyclonal antibodies (2). Marked protection of the preinoculated trees of sweet orange/sour orange (2), grapefruit/TRF, and Hassaku/TRF against CTV-SY are recognized in a glasshouse (3). However, the protective factors were unknown. CVEV No. 1605 was obtained by tissue grafting from a sweet orange seedling tree planted in the field.

Preinoculated trees were propagated on TRF rootstocks in 1981 in a glasshouse, and transplanted in a field in 1983 and afterward exposed to natural transmission of CTV. The field was close to sweet orange trees which carried severe strains of CTV.

RESULTS AND DISCUSSION

Field trial at Okitsu Branch. After the challenge inoculation and

TABLE 1
GROWTH OF PREINOCULATED MORITA NAVEL ORANGE TREES IN A FIELD AT
OKITSU BRANCH, FRUIT TREE RESEARCH STATION

Preinoculated strain	Total no. of trees	No. of trees in each group					
		Tree vigor			Stem pitting		
		Vigorous	Interm.	Decline	Non	Mild	Severe ²
M-8	8	2	4	2	1	5	2(1)
M-10	8	3	2	3	5	1	2(1)
M-15A	5	3	2	0	3	0	2
M-16A	11	5	5	1	7	2	2
M-23A	10	4	2	4	6	2	2
M-23	4	2	0	2	1	2	1
M-24	8	1	2	5	5	1	2(1)
V-16A	4	2	0	2	3	0	1
None	8	0	7	1	0	0	8(2)

²Figures in parenthesis show the number of trees with extensive stem-pitting observed in September 1989.

exposure to natural transmission, all non-preinoculated trees used as controls became dwarfed and developed severe stem pitting (Table 1). Among preinoculated trees, there were no plots in which all trees were vigorous and free of CTV-symptoms, i.e., some trees grew very well whereas others declined. However, several trees preinoculated with M-15A and M-16A grew well. Preinoculation with M-23A, V-16A and M-23 was the next best, while preinoculation with M-8, M-10 and M-24 seemed to have little effect.

The data obtained up to 1989 show that preinoculation with CTV mild isolates, M-15A and M-16A, is prom-

ising for control of tristeza stem pitting disease of navel orange.

Field trial at Kuchinotsu Branch. Preinoculated trees of Morita Navel orange with No. 145 and CVEV No. 1605 grew very well with mild stem-pitting (Table 2). In contrast old budline trees and non-preinoculated trees used as controls were dwarfed with severe stem-pitting. Preinoculated trees of Yoshida Navel orange with No. 145 also grew vigorously (Table 2).

The data show that preinoculation with source No. 145 is promising to control stem pitting disease of navel orange. Some prefectural research stations started extended trials and

TABLE 2
GROWTH OF PREINOCULATED NAVEL ORANGE TREES IN A FIELD AT
KUCHINOTSU BRANCH, FRUIT TREE RESEARCH STATION²

Varitey	Preinoculated strain	No. of trees in each group			Canopy volume (m ³)	Trunk girth (cm)
		Vigor.	Interm.	Decline		
Morita	None	2	3	0	3.7	15.9
	CVEV No. 1605	4	0	0	4.3	20.8
	No. 145	4	1	0	5.7	18.5
	Old budline ³	0	0	4	1.9	12.0
Yoshida	None	0	4	1	1.8	11.8
	CVEV No. 1605	1	3	0	2.4	13.4
	No. 145	4	1	0	3.2	16.7
	Old budline ³	0	0	3	1.5	12.5

²Observations were made in October, 1989.

³Buds were collected from a tree which was used for virus-free treatments by shoot-tip grafting and has been infected with severe strain of CTV-SY.

their preliminary data suggested similar protection of the preinoculated trees with No. 145. However,

protective factors have been unknown.

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