

UC Riverside

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

Title

Goutoucheng-A New Indicator Plant for Citrus Mosaic Virus

Permalink

<https://escholarship.org/uc/item/4km1383b>

Journal

International Organization of Citrus Virologists Conference Proceedings
(1957-2010), 12(12)

ISSN

2313-5123

Authors

Changyong, Z.
Xueyuan, Z.
Yuanbui, J.

Publication Date

1993

DOI

10.5070/C54km1383b

Peer reviewed

Goutoucheng - A New Indicator Plant for Citrus Mosaic Virus

Zhou Changyong, Zhao Xueyuan and Jiang Yuanhui

ABSTRACT. Seedlings of Goutoucheng, possibly a sour orange hybrid, were grafted-inoculated with budwood containing citrus mosaic virus (CiMV). One year following inoculation, the leaves of the young spring shoots showed yellowing and gradually developed mosaic symptoms. In contrast, leaves of young spring shoots of Goutoucheng inoculated with satsuma dwarf virus (SDV) showed no symptoms. We therefore suggest Goutoucheng as a new indicator plant for CiMV which can be used to differentiate CiMV from SDV.

Citrus mosaic disease was first recorded in the Arita district of Wakayama prefecture, Japan in the 1940s and identified as a virus disease in 1958 (2). Citrus mosaic virus (CiMV)-infected Satsuma trees showed symptoms of boat-shaped leaves on short bushy twigs, similar to those caused by satsuma dwarf virus (SDV). The characteristic symptoms of CiMV infection is the ring spot on the fruit rind at color break (2). The distribution of CiMV was restricted to the Arita District for a long time, but during the 1970s scion budwood of Miyamoto, a new clone of satsuma, was top-grafted on CiMV-infected satsuma trees and budwood of this cultivar was widely distributed in Japan (7).

CiMV is closely related to SDV serologically by its reaction in herbaceous hosts and in its particle shape and size. Thus it is difficult to differentiate CiMV from SDV by known techniques (1, 3, 4, 6). Usugi (5) reported that Marsh grapefruit could be considered as a specific indicator of CiMV since the infected plants showed a typical ringspot symptom on leaves during the spring flush of growth.

Since the Miyamoto satsuma was introduced to China from Japan in the 1980s and showed symptoms of boat-shaped leaves, some indexing was done to examine whether the symptoms were caused by SDV or CiMV. Known SDV and CiMV infected materials for use as inoculum for positive control in the indexing were kindly supplied by Dr. T. Miyakawa from Japan. Known

CiMV-infected plants were held in a greenhouse. Buds from these plants were grafted to Goutoucheng as the rootstock in 1988. In the spring of 1990, some of the leaves on new sprouts from the Goutoucheng rootstocks showed mosaic symptoms. Experiments were therefore conducted to determine whether these mosaic symptoms were caused by CiMV.

MATERIALS AND METHODS

Two-year-old seedlings of Goutoucheng were used as indicators. Three seedlings respectively were graft-inoculated with budwood containing CiMV, CiMV plus citrus tristeza virus (CTV), SDV plus CTV and the virus which infected the Miyamoto satsuma. The inocula used were one bud and two pieces of shoot bark collected from each source plant. Negative control seedlings were grafted with buds and bark collected from healthy satsuma seedlings. All of the seedlings were heavily pruned in June, 1991 and again in March, 1992 to enhance development of new sprouts and symptoms were recorded on newly developing leaves.

RESULTS AND DISCUSSION

After the graft inoculation of April, 1991, none of the new shoots of any plants sprouting during that same year showed symptoms. However, in early April, 1992 young shoots of six Goutoucheng seedlings inoculated

with CiMV or CiMV + CTV, showed yellowing, with small curled leaves (Fig. 1). In mid-April, the new emerging leaves developed mosaic symptoms, similar to the symptoms observed in the spring of 1991 on the sprouts of the Goutoucheng rootstock which had previously been grafted with CiMV-infected buds (Fig. 2). After the leaves

of the spring shoots matured, the leaf mosaic symptoms gradually disappeared, probably due to the onset of warmer temperatures. Young leaves of the plants inoculated with SDV + CTV or the virus which infected the Miyamoto satsuma and the negative control plants were all normal in color and size.



Fig. 1. The young shoots of Goutoucheng seedlings showing yellowing after CiMV inoculation (left normal, right infected).



Fig. 2. Goutoucheng seedling showing leaf mosaic in the spring shoots after citrus mosaic virus infection.

These results indicated that the yellowing, small leaf size and leaf mosaic which developed on the sprouts of the spring flush are characteristic of symptoms for CiMV on Goutoucheng, and were not modified by the presence of CTV. These symptoms were not found in seedlings infected with SDV + CTV or the controls. Therefore the Goutoucheng may be used as an indicator to differentiate CiMV from SDV.

The virus which infected Miyamoto satsuma and induced boat shaped

leaves gave similar reaction to that of SDV or CiMV when mechanically transmitted to sesame indicator plants or when tested by ELISA (8). However, Goutoucheng seedlings inoculated with SDV did not show yellowing or leaf mosaic on the newly developing shoots in the spring. These preliminary results indicate that the Miyamoto satsuma was infected with SDV, but not with CiMV.

LITERATURE CITED

1. Imada, J., S. Narisawa, and H. Tanaka
1977. Serological relationship among satsuma dwarf group viruses. *Ann. Phytopath. Soc. Japan* 43: 101.
2. Ishigai, T., and M. Jinno
1958. On citrus mosaic. *Ann. Phytopath. Soc. Japan* 23: 29.
3. Tanaka, H., and J. Imada
1974. Mechanical transmission of viruses of satsuma dwarf, citrus mosaic, navel infectious mottling and Natsudaikai dwarf to herbaceous plants, p. 141-145. *In Proc. 6th Conf. IOCV. IOCV, Riverside.*
4. Tanaka, H., and J. Imada
1976. Purification of viruses of citrus mosaic and navel orange infectious mottling, p. 116-118. *In Proc. 7th Conf. IOCV. IOCV, Riverside.*
5. Usugi, T.
1980. Plant virus diseases (22) - citrus mosaic. *Agric. and Hort. Japan* 55(11): 2.
6. Usugi, T., and T. Tsuchizaki
1982. Detection of citrus mosaic virus by ELISA. *Ann. Phytopath. Soc. Japan* 48: 330-332.
7. Yamamoto, S., and A. Yamaguchi
1980. Spread of citrus mosaic through distribution of a new clone of satsuma mandarin, p. 230-231. *In Proc. 8th Conf. IOCV. IOCV, Riverside.*
8. Zhou, C. Y., X. Y. Zhao, Y. H. Jiang and X. H. He
1993. The occurrence of satsuma dwarf virus in China, p. 349-351. *In Proc. 12th Conf. IOCV. IOCV, Riverside.*