Phytoparasitica
DOI 10.1007/s12600-014-0387-4

Evidence for resistance to *Citrus tristeza virus* in pomelo (*Citrus maxima* Merr.) grown in Darjeeling and Sikkim hills of India

Amalendu Ghosh · Amrita Das · Ramu Meena · V. K. Baranwal

Received: 19 July 2013 / Accepted: 15 January 2014

Abstract Darjeeling and Sikkim hills of India are well known for production of mandarin orange (*Citrus reticulata*). The recent spread of *Citrus tristeza virus* (CTV) has threatened the citrus cultivation in this region. During a survey in Darjeeling and Sikkim hills, pomelo trees were recorded as CTV free. Since pomelo trees did not show any disease appearance, a study was undertaken to ascertain whether they are resistant to CTV infection or resistant to aphid feeding or both. *Toxoptera citricida*, the most efficient aphid vector and which is abundantly present in this region, did not feed on pomelo when other *Citrus* species such as mandarin, kagzi lime and rough lemon were available. Additionally, CTV isolates of Darjeeling and Sikkim hills were not transmissible to pomelo either by *T. citricida* or grafting. We report for the first time that pomelo is resistant to isolates of CTV present in this region.

Keywords CTV · Host preference · Kagzi lime · Mandarin · Rough lemon · Strain · *Toxoptera citricida*

A. Ghosh · A. Das (✉) · R. Meena
Indian Agricultural Research Institute,
Regional Station, Kalimpong 734301 WB, India
e-mail: amritapatho@gmail.com

V. K. Baranwal
Plant Virology Unit, Division of Plant Pathology, Indian Agricultural Research Institute,
New Delhi 110 012, India

Introduction

Tristeza disease caused by *Citrus tristeza virus* (CTV) is one of the most destructive and economically important viral diseases of citrus worldwide (Bar-Joseph *et al.* 1989; Rocha-Pena *et al.* 1995). Among plant RNA viruses, CTV belongs to the genus *Closterovirus* of family *Closteroviridae*. CTV virions have a single-stranded positive-sense RNA genome (~19.3kb) encapsidated in flexuous filamentous particles of ~2000 nm (Bar-Joseph *et al.* 1989). CTV is phloem-limited and transmitted in a semi-persistent manner by the brown citrus aphid, *Toxoptera citricida* Kirkaldy (Broadbent *et al.* 1996; Roy *et al.* 2005). Depending on the citrus variety and the rootstock used, CTV isolates induce various disease syndromes (Huang *et al.* 2004; Satyanarayana *et al.* 2001). The two most important CTV syndromes are decline and stem pitting, which debilitate the tree and reduce fruit size and yield. Mild isolates cause mild or no symptoms in sensitive citrus indicator hosts and usually result in no economic loss in commercial cultivars, whereas severe isolates cause decline, stem pitting, or both – which may vary in intensity (Garnsey *et al.* 1987).

During our survey in Sikkim and Darjeeling hills of India, well known for the production of mandarin oranges, pomelo trees were found apparently healthy. The presence of CTV in this area has been documented since the 1980's (Ahlawat *et al.* 1992; Mukhopadhyay *et al.* 1986; Ghosh *et al*. 2014) and has become a major constraint for mandarin orange cultivation. Since pomelo trees did not show any disease symptoms in our preliminary study (Ghosh *et al*. 2014), an experiment was

Published online: 01 February 2014