



## Association of *Bhendi yellow vein mosaic virus* and Cotton leaf curl Multan betasatellite with *Capsicum annuum* From Kashmir valley, India

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*Capsicum annuum* (sweet pepper or bell pepper), known as simla mirch in India is one of the leading vegetables grown in the open as well as under protected cultivation. In the Kashmir valley, India, whitefly infestation and begomovirus-like symptoms viz. malformation, leaf curling, vein clearing and stunting were observed in capsicum plantations (Fig. 1). The incidence under protected cultivation was very high ranging from 10% to 40% whereas under field conditions it was less than 10%. The presence of whiteflies and symptoms called for the investigation of possible begomovirus infection.

Total DNA from infected capsicum leaves was extracted using the CTAB method (Doyle & Doyle, 1999). Circular DNA was specifically amplified using rolling circle amplification (RCA). PCR was performed with a pair of degenerate primers specific to the begomovirus coat protein gene (Kumar *et al.*, 2010) and for beta satellite (Briddon *et al.*, 2003) using the RCA product. The PCR product was subject to electrophoresis on a 1.0% agarose gel in tri-acetate-EDTA (TAE) buffer, stained with ethidium bromide, and viewed on a UV-transilluminator. The amplicons were cloned in the TOPO (Invitrogen pCR 2.1) vector and sequenced (GenBank Accession Nos. LN624485, LN610993 and LN610994). The amplified coat protein revealed 99% similarity with *Bhendi yellow vein mosaic virus* (Palampur, India; FR694925). (Okra is known as bhendi or bhindi in most parts of northern India.) For studying the phylogeny of the associated beta satellite a maximum likelihood tree was generated using MEGA6 software (Tamura *et al.*, 2013) by multiple sequence alignment of the capsicum beta satellite sequences (LN610993 and LN610994) with other previous

reported sequences. These sequences clustered with KR013746 (Pakistan) with high bootstrap values (Fig. 2). *Capsicum* has not previously been reported as a host of *Okra yellow vein mosaic virus* anywhere in the world but is described here for the first time from the Srinagar valley, Jammu and Kashmir, India.

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Figure 1

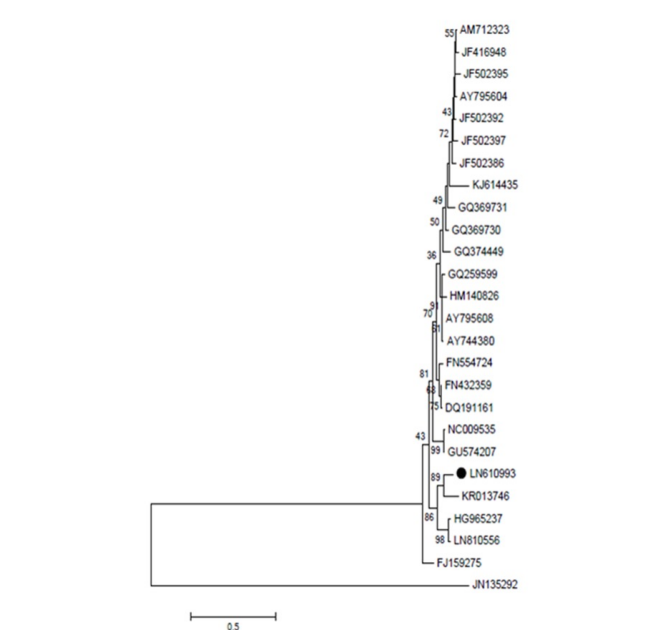


Figure 2

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