New Disease Reports

Valeriana jatamansi as a new natural host of *Bhendi yellow vein mosaic virus* and *Papaya leaf curl virus betasatellite* from Northern India

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Valeriana jatamansi, a rhizomatous herb in the family Valerianceae, popularly known as Indian valerian, is found in all temperate and sub-tropical areas of the world. The herb is used in traditional Indian medicine and regarded as an aphrodisiac, antispasmodic, tranquiliser, antiseptic, expectorant, febrifuge, nerve tonic, ophthalmic and sedative. The essential oils of root extracts have antioxidant activity (Thusoo *et al*., 2014). During a survey in June 2014, *V. jatamansi* growing in a herbal garden in the CSIR-IHBT campus, Palampur (Latitude: 32°7'N; Longitude: 76°32'E) was displaying crinkling of leaves (Fig.1) and whitefly infestation. Both of these features suggested begomoviral infection and attempts were made to detect the virus. To achieve this, total genomic DNA was subjected to rolling circle amplification (RCA) using the TempliPhi™Amplification Kit (GE Healthcare, USA). The RCA product was subjected to PCR amplification using begomovirus specific degenerate primers 302 (5'-TGTGARGGYCCWTGYAARGTYCA-3') and 424 (5'-CARRTMMRRTTCAAYHACAACMTVMGGA-3'; Zaffalon *et al*., 2012). These primers amplified a fragment ~850 bp in size which contained partial sequences of virion DNA-A (Fig. 2a). Specific primers for betasatellite DNA (Briddon *et al*., 2002), amplified a ~1.3 kb fragment (Fig. 2b). The 1.3 kb betasatellite and 850bp DNA-A amplicons were cloned and sequenced (GenBank Accession Nos. LN831956 and LN831955, respectively).

Analysis of the sequence data revealed that the DNA-A specific amplicon shared 93-99% nucleotide sequence identity with several *Bhendi yellow vein mosaic virus* (BYVMV) isolates from *Abelmoschus esculentus* (Fig. 3). Okra is commonly known as bhendi in India and hence some *Okra yellow vein mosaic* isolates are also nominated as BYVMV. The 1367 bp sequence of betasatellite DNA showed highest nucleotide identity (95%) and closest phylogenetic relationship with *Papaya leaf curl virus betasatellite* isolate PaLCuB-Pumpkin: IARI (JX040472) reported from pumpkin (*Cucurbita pepo*) (Fig. 4). In order to assess the level and prevalence of virus infection on *V. jatamansi*, 80 samples from two locations (40 each) were collected. These samples were collected from plants randomly exhibiting mild or severe crinkling or no symptoms. Total DNA was extracted from the samples and tested for the presence of BYVMV by Southern blot hybridization (Sambrook *et al*., 1989) using a non-radioactive DIG labelled virus-specific probe (Roche, Germany). Results revealed that 32 of the 80 samples (40%) tested positive for the virus.

To the best of our knowledge this is the first report of begomovirus associated DNA-A and betasatellite infection of *V. jatamansi.* Apart from *A. esculentus*, BYVMV has been found at sites distant from those described here in the deciduous shrub *Litsea* spp. (Roy *et al*., 2015). As *V. jatamansi* is present as a natural population, the presence of begomovirus and betasatellite DNA suggests that *V. jatamansi* may act as a reservoir for the virus with the potential to cause devastating diseases on vegetables.

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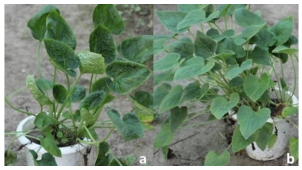

Figure 1

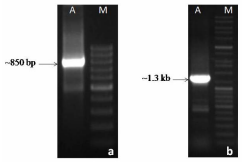

Figure 2

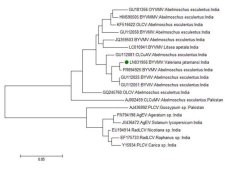

Figure 3

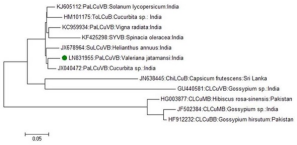

Figure 4

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