First Report on Occurrence of *Pelargonium leaf curl virus* (PLCV) in Shimla Hills, India

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Pelargonium leaf curl virus (PLCV) is a soil borne plant virus and member of the family *Tombusviridae*. Tombus virus group was established [1]. *Pelargonium zonata* plants showing chlorotic stellate symptoms on leaves accompanied with leaf deformation were regularly observed at Shimla during November and March (Fig. 1a–c). During summer, there is remission of symptoms and virus becomes non-detectable. Characteristic yellow, stellate spots develop on young leaves of diseased pelargonium during late winter; they usually become necrotic and as the surrounding tissue expands, leaves become buckled and distorted. Similar symptoms and observation have been described previously [2]. Electron microscopic examination of a negatively stained preparation made from extract of infected leaf tissue

[3] resulted the presence of a high concentration of isometric virus particles measuring about 28 nm in diameter (Fig. 1d). Ultra-thin sections of infected leaf tissue revealed the presence of multivesicular bodies in the cytoplasm. Some of the cells had virus crystals (Fig. 1e, f). These all observation resembling with the earlier described results [5]. For precise identification, primers were designed for the amplification of coat protein gene on the basis of available sequences of PLCV in the NCBI database. Use of reverse transcription-polymerase chain reaction (RT-PCR) with specific primer for PLCV coat protein gene resulting in a product of 1,100 bp has already been reported [4]. To our knowledge, this is the first report of natural infection of PLCV on *Pelargonium* in India.

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Fig. 1 **a, c** Symptomatic plants of *Pelargonium* infected with *Pelargonium leaf curl virus* (PLCV). **b** Characteristic yellow, stellate spots developed on young leaves of pelargonium during late winter. **d** Electron micrograph of negatively stained preparation of virus extract from fixed leaf tissue. **e** Vascular cell showing presence of a virus crystal and scattered virus particles in the cytoplasm. **f** Electron micrograph of ultra thin section of infected tissue showing multivesicular bodies typical of *Tombusviridae* in the cytoplasm. **g** Electron micrograph of thin section of infected leaf tissue showing origin of multivesicular body from chloroplast. **h** RT-PCR detection of PLCV, Lane 1 1 Kb ladder, Lane 2 amplified CP gene indicated with arrow. (Color figure online)

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