New Disease Reports

First report of '*Candidatus* Phytoplasma asteris' (16SrI group) associated with yellows disease of gerbera (*Gerbera jamesonii*) from India

K.K. Gautam [1], Ashish Srivastava [1], Susheel Kumar [1], S.K. Snehi [1], S.K. Raj [1]* and C.S. Nautiyal [2]

[1] *Plant Molecular Virology, CSIR-National Botanical Research Institute, Lucknow-226001, India*; [2] *Division of Plant Microbiology, CSIR-National Botanical Research Institute, Lucknow-226001, India*

*E-mail: skraj2@rediffmail.com

Received: *12 Sep 2014.* ***Published:*** *17 May 2015.* ***Keywords:*** *severe leaf yellows, phylogenetic analysis, 'Ca. P. asteris'*

Gerbera jamesonii (Asteraceae) is an important ornamental plant grown throughout the world. It is amongst the ten most important cut flowers in floricultural trade. In 2012, severe leaf yellows, shortening of whole plant and flower deformation symptoms were observed on gerbera plants growing in a polytunnel at Lucknow, Uttar Pradesh, India. The disease incidence on gerbera was about 15-20%. Symptoms exhibited by diseased gerbera were suggestive of the presence of phytoplasma. Total DNA was extracted from leaf samples collected from symptom-bearing plants (Ahrens & Seemüller, 1992) and PCRs were performed using P1/P6 universal primers (Deng & Hiruki, 1991) followed by nested PCR using primers R16F2n/R16R2 (Gundersen & Lee, 1996). Products of ~1.2 kb were amplified for four out of four samples from symptom-bearing plants, but not from the symptomless plants, demonstrating the association of a phytoplasma with the disease.

Amplicons from two samples, *Gerbera jamesonii* yellows phytoplasma Lucknow 1 (GYLu1) and *Gerbera jamesonii* yellows phytoplasma Lucknow 2 (GYLu2), were cloned, sequenced and sequence data was deposited in GenBank, under Accession Nos. JX674049 (GYLu1) and KC880350 (GYLu2). Sequence comparison using BLASTn (http://blast.ncbi.nlm.nih.gov/Blast.cgi) revealed 99% homology between GYLu1 and GYLu2. GYLu1 and GYLu2 also shared 99% sequence identity with several strains of '*Candidatus* Phytoplasma asteris' reported worldwide. A similarity of 98% was verified between GYLu1 and GYLu2 when compared with the sequence of '*G. jamesonii*' phytoplasma (JF795864), a member of '*Ca.* P. asteris' from Italy. To find out phylogenetic relationships of the gerbera phytoplasma strains under study and 16S rDNA sequences of '*Ca.* P. asteris' strains and other phytoplasmas available in GenBank, a phylogenetic tree was generated using the neighbour-joining method (Fig. 1). The results demonstrated that GYLu1 and GYLu2 clustered with the strains of '*Ca.* P. asteris'. Based on high sequence identities (99%) and close phylogenetic relationships with Italian gerbera phytoplasma strain of '*Ca.* P. asteris', the gerbera phytoplasmas from India were identified as '*Ca.* P. asteris'-related strains

Gerbera is reported as a host of strains of '*Ca.* P. aurantifolia' (group 16SrII) in Australia (Siddique, 2005), and '*Ca.* P. asteris' in Italy (Spanò *et al.*, 2011). In India, '*Ca.* P. asteris' (16SrI group) has been reported on several plant species (Rao *et al.*, 2011). However, neither '*Ca.* P. asteris' nor any phytoplasma has been previously reported on gerbera from India. We report here the association of '*Ca.* P. asteris' with yellows disease of gerbera for the first time in India. Since gerbera is propagated by vegetative means and mass multiplication through tissue culture, detection of phytoplasma in gerbera is of utmost importance for disease management.

Acknowledgements

The authors are thankful to the Council of Scientific and Industrial Research (CSIR), New Delhi, India for funding under project BSC117.

References

Ahrens U, Seemuller E, 1992. Detection of DNA of plant pathogenic mycoplasma-like organisms by a polymerase chain reaction that amplifies a sequence of the 16S rRNA gene. *Phytopathology* **82**, 828-832.

Deng S, Hiruki C, 1991. Amplification of 16 S rRNA genes from culturable and non-culturable mollicutes. *Journal of Microbiological Methods* **14**, 53-61. http://dx.doi.org/10.1016/0167-7012(91)90007-D

Gundersen DE, Lee IM, 1996. Ultrasensitive detection of phytoplasmas by nested-PCR assays using two universal primer sets. *Phytopathologia Mediterranea* **35**, 144-151.

Rao G, Mall S, Raj S, Snehi S, 2011.Phytoplasma diseases affecting various plant species in India. *Acta Phytopathologica et Entomologica Hungarica* **46**, 59-99. http://dx.doi.org/10.1556/APhyt.46.2011.1.7

Siddique ABM, 2005. Phytoplasma association with gerbera phyllody in Australia. *Journal of Phytopathology* **153**, 730-732. http://dx.doi.org/10.1111/j.1439-0434.2005.01036.x

Spanò R, Marzachì C, Mascia T, Bubici G, Gallitelli D, 2011. First report of '*Candidatus* Phytoplasma asteris' from *Gerbera jamesonii* in Apulia, Southern Italy. *Journal of Plant Pathology* **93**, S463. http://dx.doi.org/10.4454/jpp.v93i4.2361

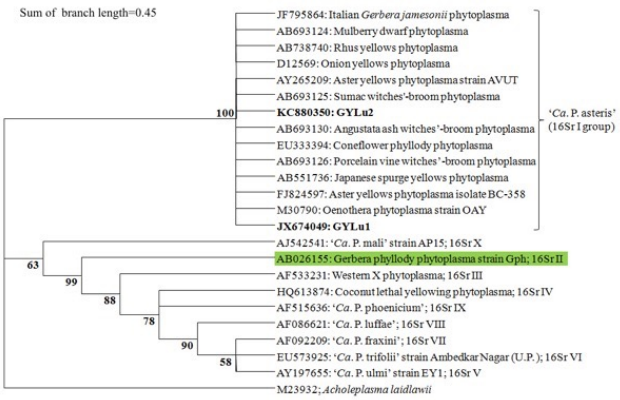

Figure 1

To cite this report: Gautam KK, Srivastava A, Kumar S, Snehi SK, Raj SK, Nautiyal CS, 2015. First report of '*Candidatus* Phytoplasma asteris' (16SrI group) associated with yellows disease of gerbera (*Gerbera jamesonii*) from India. *New Disease Reports* **31**, 24. http://dx.doi.org/10.5197/j.2044-0588.2015.031.024

 This report was published on-line at www.ndrs.org.uk where high quality versions of the figures can be found.