

Occurrence, Distribution, and Molecular Identification of Phytoplasma-associated Diseases in Ornamental Plants

Akil Ahmad Khan, Shoeb Ahmad, and Mohd Sayeed Akhtar

Abstract Phytoplasma is recognized as the serious constraints for the many economically ornamental plants all around the world. It may reduce the quality and yield of ornamental plants and is recognized internationally because of its unspecific symptoms, severe losses, and diverse epidemiology. The epidemics of these diseases have compelled the withdrawal of many ornamental plant species such as gladiolus, lily, chrysanthemum, and rose from cultivation. So far, more than 42 ornamental plant species were reported as infected by phytoplasma. The general symptom includes flower malformation, growth abnormalities, yellowing or decline of leaves, elongation and etiolation of internodes, witches' broom, stunting, little leaf, and virescence. The knowledge on the diversity and identification of phytoplasma has been explored with the molecular tools and techniques showing that phytoplasma infecting the ornamental plant *Candidatus* Phytoplasma asteris belongs to a major 16SrI group. The other known groups of phytoplasmas are 16SrII, 16SrIII, 16SrV, 16SrVI, 16SrVII, 16SrIX, 16SrX, 16SrXII, 16SrXIII, and 16SrXV. For the detection of phytoplasma in the infected plant parts or tissues, the 16S rRNA gene fragments were amplified using phytoplasma universal primer pairs P1/P7 in a polymerase chain reaction (PCR) followed by primer pairs R16F2n/R16R2 in the nested PCR. Nevertheless, for the finer detection of phytoplasma-related *Candidatus* Phytoplasma asteris, DNA samples were used to extend the *RP* and *Tuf* gene fragments by PCR using aster yellows group-specific primer pairs RP(1)F1A/RP(1)R1A and fTufAy/rTufAy, respectively. However, the restriction fragment length polymorphism (RFLP) analysis of *RP* gene fragments digested with AluI, MseI, and Tsp5091 restriction enzymes indicates the presence of aster yellows group. The aim of the present chapter is to provide an overview of the phytoplasma-associated diseases in ornamental plants, their mode of transmission, and the molecular techniques employed to detect the phytoplasma in the infected plant parts or tissues.

Keywords *Candidatus* • PCR • RFLP • Transmission • Aster yellows disease

A.A. Khan (✉) • S. Ahmad • M.S. Akhtar (✉)
Department of Botany, Gandhi Faiz-E-Aam College,
Shahjahanpur 242001, Uttar Pradesh, India
e-mail: sayeedbot@gmail.com; akil_nbri@yahoo.com