

Mechanisms of RNA-Mediated Resistance to Plant Viruses

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1. Introduction

Viral diseases cause significant losses to almost all crops throughout the world. Infections with plant viruses can either cause direct yield losses or lead to unacceptable levels of postharvest damage to the crops. Besides measures to limit the virus incidence, the ultimate way to minimize losses caused by viral infections is the production of resistant varieties. This can be obtained by introgression of resistance genes from wild relatives, or by transformation of host plants with antiviral genes or viral sequences. Expression of viral coat protein (CP) in plants yields protection to the homologous virus. In addition to this CP-mediated protection (CPMR), a still growing number of reports deal with engineered virus resistance conferred by transgenic expression of viral transcripts, rather than proteins.

This chapter will describe this so-called RNA-mediated virus resistance (RMR) in more detail and discuss possible working mechanisms of this powerful technology.

2. Plant Resistance to Viruses

Most plants are resistant to or can hardly be infected by viruses. Nevertheless, plant viruses gained a significant impact in agriculture. First, breeding has usually been focused on gaining higher yields and improved product quality, rather than resistance to pathogens. Second, crop cultivations have been scaled up enormously, leading to monocultures, which makes the crops highly attractive for specific pathogens. Third, because of the intensified worldwide transport of plant material, viruses meet new host plants and vice versa. In contrast to infection with other pathogens, virus infections cannot be cured.