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Management of plant virus diseases by grafting: a biological control

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The recourse to virus-resistant varieties is attempted but moderately successful as resistance breaking strains (RB) or recombinant strains quickly emerge and replace extant viral population. Grafting of commercial tomato varieties and hybrids onto an old Apulian tomato variety (Sl-Ma) resulted in high level of resistance to a Sw5-breaking strain of *Tomato spotted wilt virus* via RNA silencing (RNAi). Consistent with previous findings, the evaluation of Sl-Ma RNAi-based response was analyzed in grafted plants challenged with a recombinant strain of *Potato virus Y* (PVY^{C}-to) necrogenic to tomato, and with a strain of *Cucumber mosaic virus* (CMV-TTS) carrying a satRNA involved in the induction of the top stunting phenotype in tomato. Accumulation of PVY^{C}-to RNA was commensurate to the severity of symptoms observed, with a clear decrease in plants grafted on Sl-Ma. Attenuation of symptoms severity was observed also in grafted plants challenged with CMV-TTS but it was not accompanied by a reduction in virus titer. Transcriptome analysis of key enzymes of RNAi pathway showed that the graft itself is involved in the response of grafted plants to viral infection by the upregulation of DCL2, AGO1 and RDR1. AGO4 and RDR6 were upregulated moderately only in the case of CMV-TTS. Influence of TTS-satRNA on these secondary contributors to the RNAi-based response, were evaluated. Studies in progress in our lab suggest that grafting onto selected vegetable varieties could be a new environmentally friendly and flexible approach for the containment of plant virus diseases.