Ectopic expression of translation initiation factor eIF4E extends the resistance spectrum against Lettuce mosaic virus in lettuce

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In recent years, the identification of host factors required for the viral cycle as target for natural plant resistance to viruses opens a new research area to promote the genetic control of viral diseases. Indeed, if viruses rely upon host factors for their own survival during the infection process, modification or disruption of such factor(s) would lead to plant resistance. Eukaryotic translation initiation factors (eIF) have been shown to play a key role during virus infection in plants (Robaglia and Caranta, 2006, Trends Plant Sci. 11:40-45). Among plant translation initiation factors, eIF4E or its isoform, eIF(iso)4E, were shown to be involved in recessive resistance to several RNA viruses in numerous plant families. All resistances result from a small number of amino acid changes in the protein encoded by the recessive resistance allele. Interestingly, in pepper, tomato and lettuce, most of the resistance-related changes against different potyvirus correspond to non-conservative amino acid substitutions and are clustered in two neighboring regions at the surface of the predicted eIF4E three-dimensional structure, suggesting some shared features.

To investigate the specificity of use of eIF4E factors by different potyviruses in different hosts , we evaluated the ability of susceptibility eIF4E alleles isolated from lettuce and pepper to complement for *Potato virus Y* (PVY), *Tobacco etch virus* (TEV) and *Lettuce mosaic virus* (LMV) infection in resistant tomatoes and lettuces. Virus infectivity assays demonstrated that PVY and TEV infection of resistant tomato lines is supported by ectopic expression of *eIF4E* susceptibility alleles from lettuce and pepper whereas LMV infection of resistant lettuce lines is not supported by ectopic expression of *eIF4E* susceptibility alleles from pepper. These results provide evidence for an asymmetric functional complementation and argues in favour of distinct eIF4E-mediated resistance in solanaceae and lettuce.

To check if the ectopic over-expression of an *eIF4E* allele could perturb the interaction required for susceptibility, lettuce and pepper *eIF4E* alleles were expressed in a susceptible lettuce genotype. Dominant broad spectrum resistance against LMV, including strains for which no known natural resistance is available, were observed. To determine if this broad spectrum resistance could be explained by the sequestration of LMV by ectopically expressed eIF4E, protein-protein interaction studies are underway.

Altogether, these data suggest that potyviruses have probably developed various strategies to interact with the host's translational apparatus. The molecular basis of these strategies and specificities remains to be elucidated in order to promote the engineering of large spectrum resistance systems.

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