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A synthetic *eIF4E1* resistance allele allows resistance pyramiding and broad resistance spectrum to potyviruses in *Arabidopsis thaliana*

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Developing genetic resistance is an important alternative to the use of pesticides in order to avoid viral infections in crops. However, this approach can be limited by the lack of natural resistant alleles available for plant breeding. Biotechnologies can supply for this lack by altering susceptibility host factors used by viruses. However, strategies relying on knocking out plant host factors can be undermined by associated developmental default, or gene redundancy (Gauffier et al., 2016). Synthetic biology could offer the opportunity to develop functional synthetic alleles associated with plant resistance at no developmental cost. The translation initiation factors (eIF4E), that are associated with resistance to most single strand positive RNA (including the major group of potyviruses), are the ideal targets to validate such approaches.

We focused on the *Arabidopsis thaliana eIF4E1* gene that encodes a susceptibility factor to a potyvirus, the *Clover yellow vein virus*. Artificial resistance alleles were created by directed mutagenesis and used to complement loss-of-function *eif4e1* plants for assessing *in planta* both their functionality and resistance efficiency. By combining these synthetic resistance alleles with others eIF4E factors-mediated resistance, a broad resistance spectrum to potyviruses is expected as well as increased resistance durability. This study will make proof of the feasibility of this approach to obtaining large resistance spectrum in plants with the perspective of extending it to crops.

Reference :

Gauffier, C., Lebaron, C., Moretti, A., Constant, C., Moquet, F., Bonnet, G., Caranta, C. and Gallois, J.L. (2016) A TILLING approach to generate broad-spectrum resistance to potyviruses in tomato is hampered by eIF4E gene redundancy. *Plant J.* 85: 717–729.