Itinerary of a fluorescently labelled virus in a resistant plant

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Plant resistance to viruses is a highly effective and low-input approach to control epidemics in agricultural crops. Although the genetic determinism of many sources of resistance has been well characterized, their phenotypic expression at the plant scale is still poorly known. Yet, the extent of epidemic limitation and the evolutionary outcome of resistance deployment depend on which step(s) of the viral infectious cycle is/are targeted and impeded by plant resistance: i) infection of a healthy plant, ii) viral accumulation in the infected leaf, iii) systemic plant colonisation, and iv) transmission to new plants.

Using the pathosystem pepper-potato virus Y (PVY, *Potyvirus*), we developed an experimental approach to quantify the effect of host resistance on the two first steps. For this, we used a modified virus that expresses a Green Fluorescent Protein (GFP) and automated image analyses to: i) estimate the probability of infection by a single viruliferous aphid, and ii) monitor the dynamics of viral accumulation in inoculated leaves. Indeed, viral load, traditionally measured by destructive serological or molecular methods, can be approximated by the proportion of the leaf surface emitting fluorescence, which can be evaluated in a non-destructive way using an appropriate camera device.

Experiments on seven different accessions of pepper (*Capsicum annuum*) are currently ongoing. Early results indicate contrasted resistance profiles: accessions associated with the smallest probability of infection are not necessarily those that best mitigate subsequent viral accumulation.