

Measuring viral load by fluorescence imaging: validation of a nondestructive method to phenotype plant resistance to virus accumulation

Pierre Mustin, Elise Lepage, Marion Szadkowski, Judith Hirsch, Benoît Moury, Loup Rimbaud

▶ To cite this version:

Pierre Mustin, Elise Lepage, Marion Szadkowski, Judith Hirsch, Benoît Moury, et al.. Measuring viral load by fluorescence imaging: validation of a nondestructive method to phenotype plant resistance to virus accumulation. 18. Rencontres de virologie végétale (RVV 2021), Sep 2021, Aussois, France. hal-03368350

HAL Id: hal-03368350 https://hal.inrae.fr/hal-03368350

Submitted on 6 Oct 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial - NoDerivatives 4.0 International License

Measuring viral load by fluorescence imaging: validation of a nondestructive method to phenotype plant resistance to virus accumulation

Pierre Mustin¹, Elise Lepage², Marion Szadkowski², Judith Hirsch², Benoît Moury², Loup Rimbaud²

¹ Université de Strasbourg, INRAE, UMR-A 1131 Santé de la Vigne et Qualité du Vin, pierre.mustin@inrae.fr, F-68000 Colmar, France.

² INRAE – Pathologie Végétale, elise.lepage@inrae.fr, 84140, Montfavet, France. marion.szadkowski@inrae.fr judith.hirsch@inrae.fr benoit.moury@inrae.fr loup.rimbaud@inrae.fr

Breeding for plant resistance to viruses with conventional approaches remains a long and expensive process. In addition, it requires reliable methods to measure the efficiency of virus limitation in resistant genotypes. Such limitation may be assessed via the viral load at a given point of time, which can easily be measured using serological (e.g. quantitative ELISA) or molecular (e.g. RT-qPCR) techniques. However, because these methods are destructive, monitoring the temporal dynamics of viral accumulation in infected leaves remains a challenge.

To tackle this issue, we assessed the reliability of fluorescence imaging, a non-destructive method, for approximating virus accumulation in plants. To this end, we first carried out an experiment based on the pathosystem pepper-potato virus Y (PVY, *Potyvirus*) using a modified virus that expresses a Green Fluorescent Protein (GFP) to compare 2 quantification methods: semi-quantitative ELISA and fluorescence imaging. Secondly, we evaluated the protocol based on fluorescence imaging to monitor the kinetics of virus accumulation in 'Yolo Wonder' and 'Perennial', two well-known genotypes of pepper (*Capsicum annuum*) showing contrasted levels of resistance to PVY.

The major result indicated a significant correlation between the proportion of the leaf surface emitting fluorescence (linked to the expression of the GFP protein in infected cells) and the concentration of virus coat protein measured by quantitative ELISA. The protocol based on fluorescence imaging could thus be used to monitor viral accumulation in two pepper cultivars and highlighted contrasted kinetics. This approach will be applied in further experiments to phenotype pepper resistance to PVY.