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## Plasmodesmal Components Involved in Cell-to-cell Transport of Potyviruses---Focus on HVA22a candidate

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*Potyvirus* is one of the largest genera of plant viruses responsible for serious diseases in vegetable and fruit crops worldwide (Scholthof *et al*, 2011). The potyviral species *Turnip mosaic virus* (TuMV) represents one of the rare examples of plant viruses that utilize the host endomembrane system to produce membranous vesicles mobile between cells. The 6K2 protein of TuMV, a small transmembrane protein, induces the formation of endoplasmic reticulum (ER)-derived viral vesicles, important not only for replication but also for intracellular and intercellular movement (Cotton *et al*, 2009; Laliberté & Zheng, 2014).

In *Arabidopsis thaliana*, AtHVA22a (*Hordeum vulgare* abscisic acid responsive gene 22) belongs to a multigenic family of transmembrane proteins, homologous of reticulons and DP1/Yop1 family proteins (Chen *et al*, 2002), which are responsible for the constriction of ER tubules (Shibata *et al*, 2008). Reticulons play a role in positive strand RNA virus replication in animals and plants (Diaz *et al*, 2010). Moreover, semi-quantitative proteomics analysis of plasmodesmata (PD) fractions purified from *A. thaliana* suspension cells showed that AtHVA22c and AtHVA22a are highly enriched in PD proteome (Brault *et al*, 2019).

In our study, we showed that TuMV-6K2 interacts with AtHVA22a by split-ubiquitin yeast two hybrid assay (SuY2H) in yeast and further confirmed this interaction in planta by Bimolecular Fluorescence Complementation (BiFC). Overexpression of AtHVA22a increases TuMV propagation in *Nicotiana benthamiana*. Furthermore, AtHVA22a is partially re-localized at the level of the viral replication complex (VRC) during TuMV infection and the 6K2-induced vesicles at the PD. The interaction between AtHVA22a and 6K2 observed in BiFC is also localized at the VRC during viral infection.

Altogether, our results indicate that HVA22a is a candidate protein potentially involved in replication and cell to cell movement of TuMV.

### References:

- Brault ML, Crowet J, *et al* (2019) Multiple C2 domains and transmembrane region proteins (MCTP s) tether membranes at plasmodesmata. *EMBO reports* 20.
- Chen C-N, David T-H (2002) AtHVA22 gene family in Arabidopsis: phylogenetic relationship, ABA and stress regulation, and tissue-specific expression. 12
- Cotton S, Laliberté J-F (2009) Turnip Mosaic Virus RNA Replication Complex Vesicles Are Mobile, Align with Microfilaments, and Are Each Derived from a Single Viral Genome. *Journal of Virology* 83: 10460–10471
- Diaz A, Ahlquist P (2010) Membrane-shaping host reticulon proteins play crucial roles in viral RNA replication compartment formation and function. *Proceedings of the National Academy of Sciences* 107: 16291–16296
- Grangeon R, Laliberté J-F (2013) 6K2-induced vesicles can move cell to cell during turnip mosaic virus infection. *Frontiers in Microbiology* 4
- Laliberté J-F & Zheng H (2014) Viral Manipulation of Plant Host Membranes. *Annual Review of Virology* 1: 237–259
- Scholthof K-BG, Ahlquist P, *et al* (2011) Top 10 plant viruses in molecular plant pathology: Top 10 plant viruses. *Molecular Plant Pathology* 12: 938–954
- Shibata Y, Voeltz GK (2008) The Reticulon and Dp1/Yop1p Proteins Form Immobile Oligomers in the Tubular Endoplasmic Reticulum. *Journal of Biological Chemistry* 283: 18892–18904