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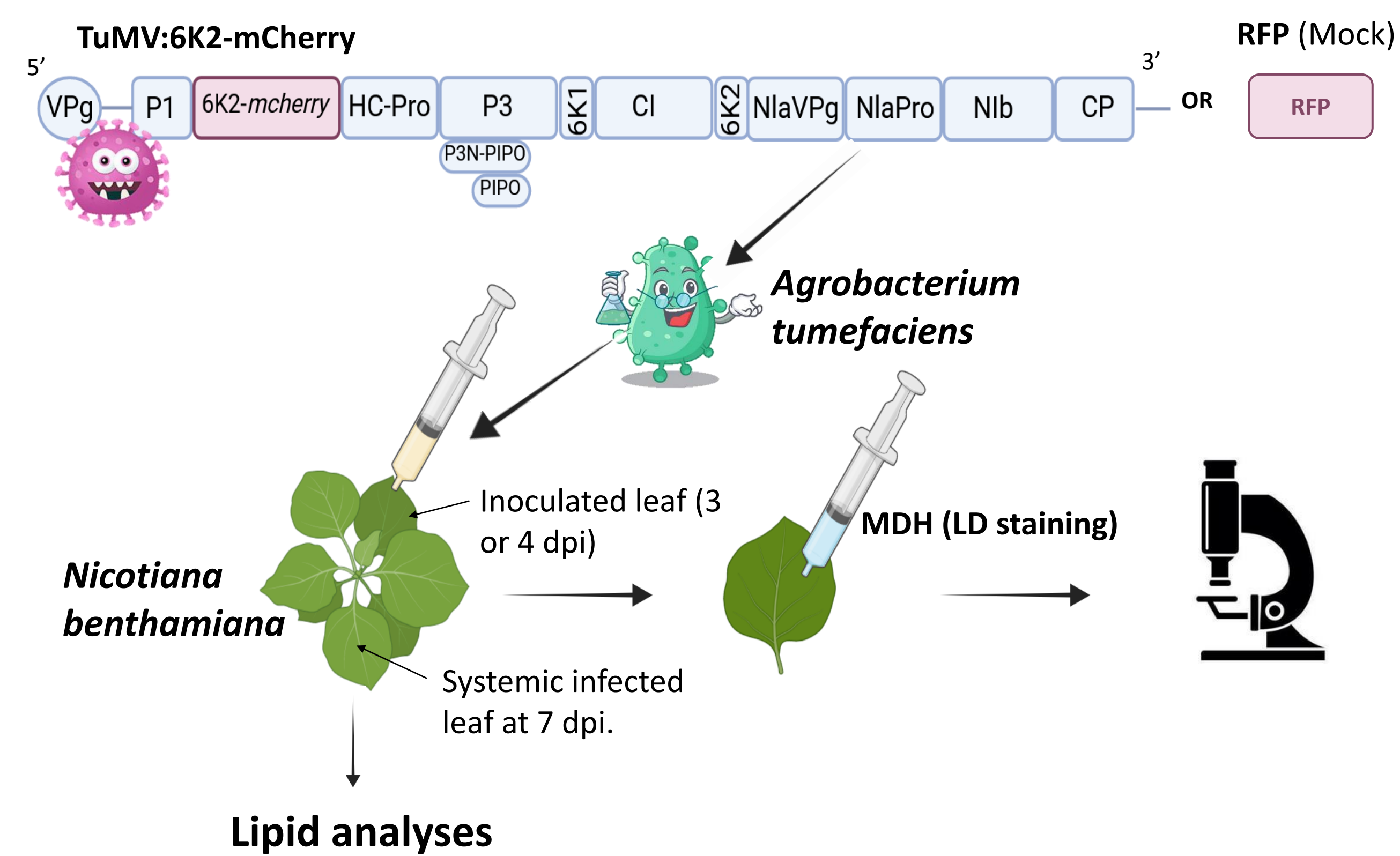
Lipid droplets : New actors of the plant virus infection

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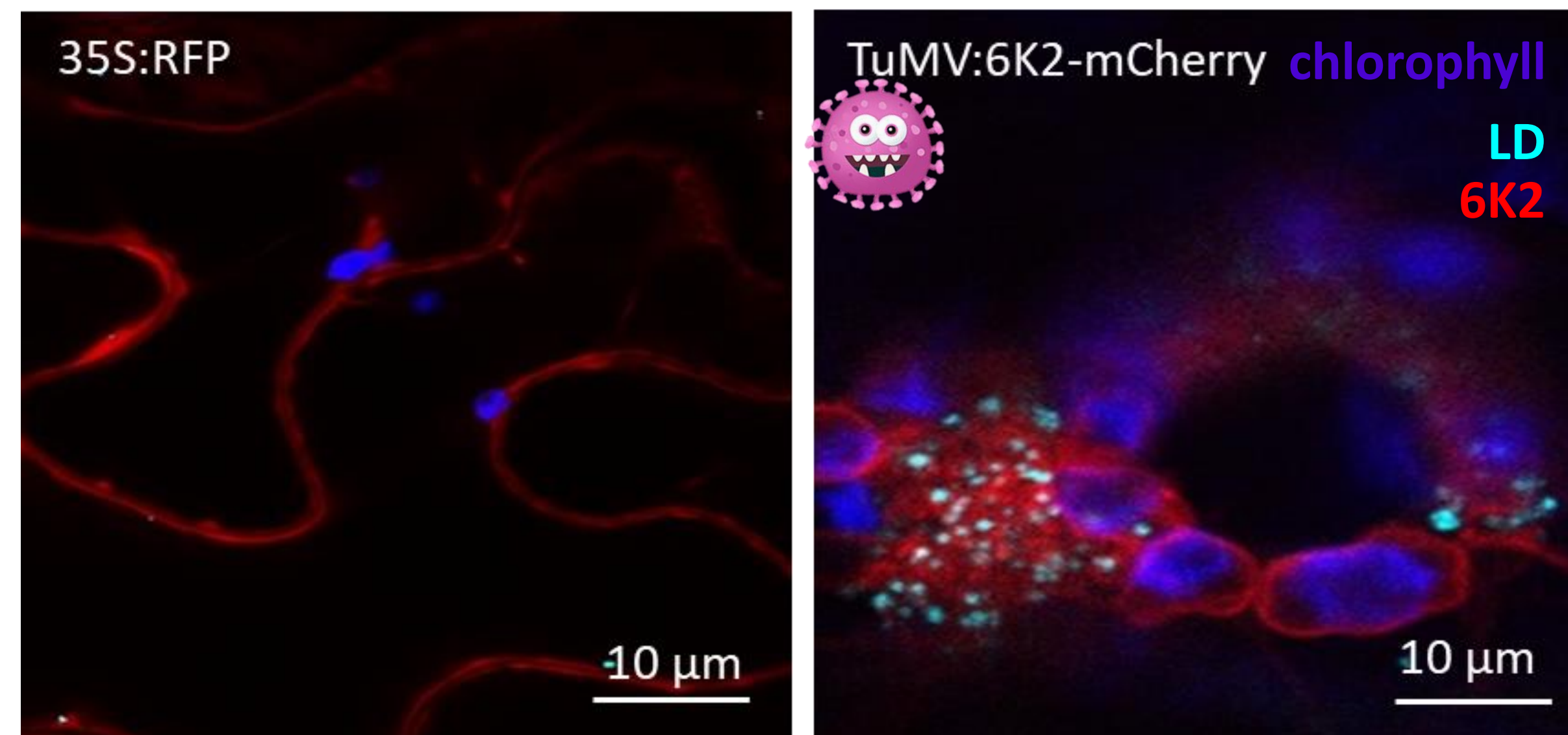
Animal viruses were recently shown to hijack **lipid droplets (LDs)** for their own benefits including viral replication and virion production. In plants, (+) ssRNA viruses represent the most abundant group of viruses and cause epidemics in all major crops. **Until now, the putative involvement of LDs in the infection cycle of plant (+) ssRNA viruses has not been investigated.** Using the potyvirus turnip mosaic virus (TuMV), **we report for the first time a pro-viral role of LD biogenesis upon plant viral infection.**

Procedure

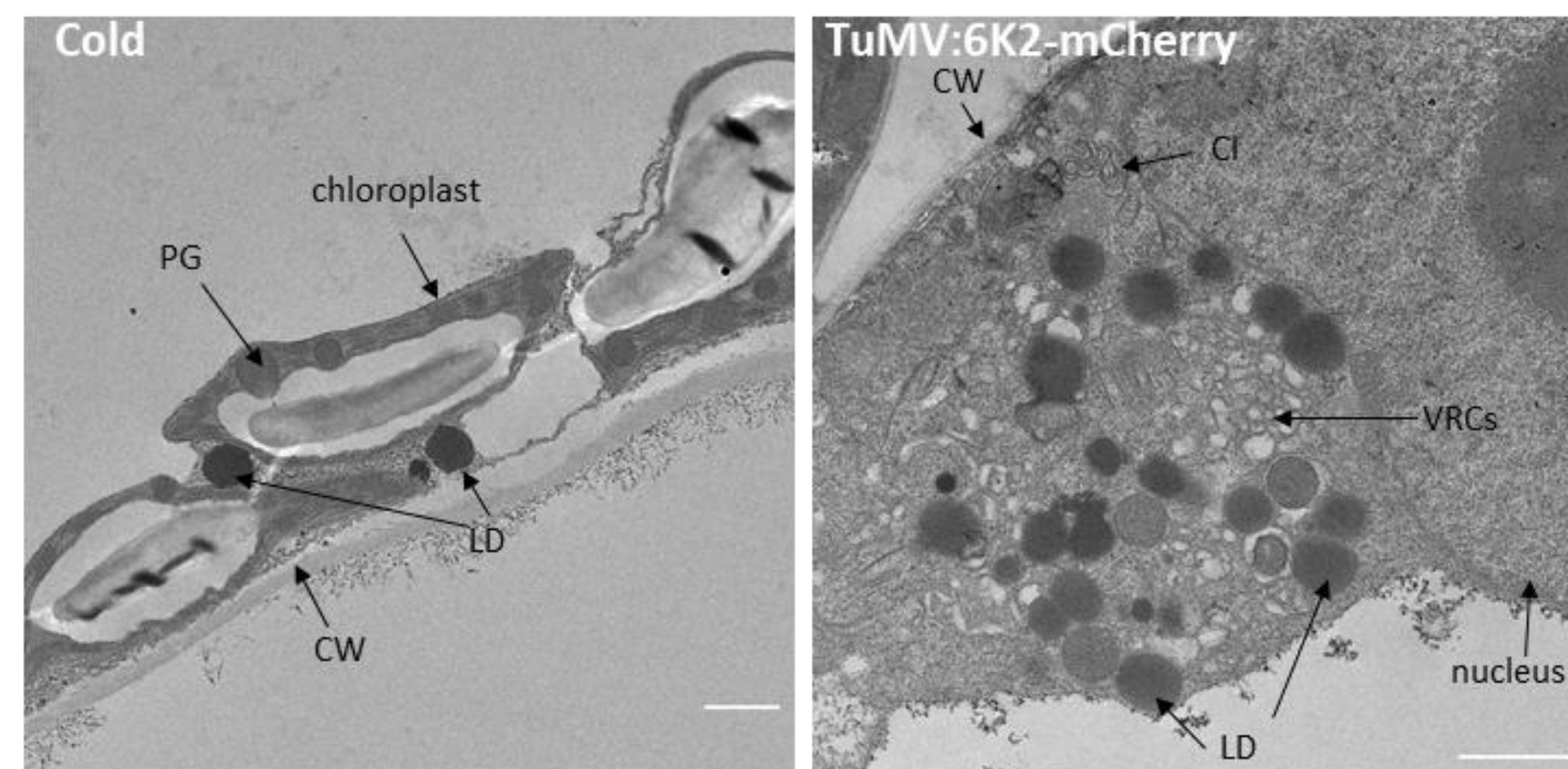


LDs accumulate in proximity to Viral Replication Compartments (VRCs) upon turnip mosaic virus (TuMV) infection

TuMV induces LD accumulation and relocalisation around the VRCs.

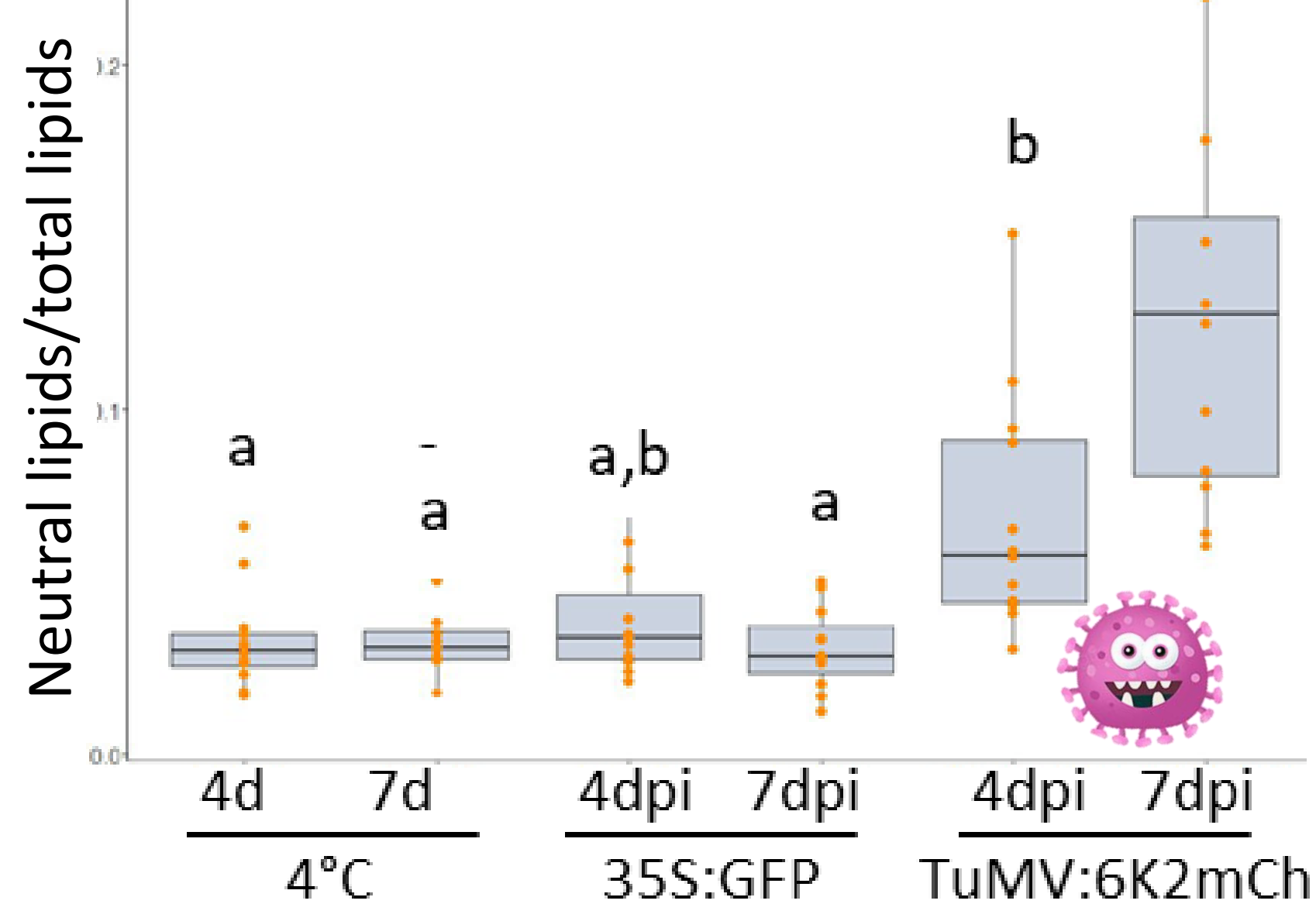


TuMV induced LDs are recruited in closed proximity to viral replication vesicles.



TuMV induces a consistent accumulation of neutral lipids in *N. benthamiana* leaves.

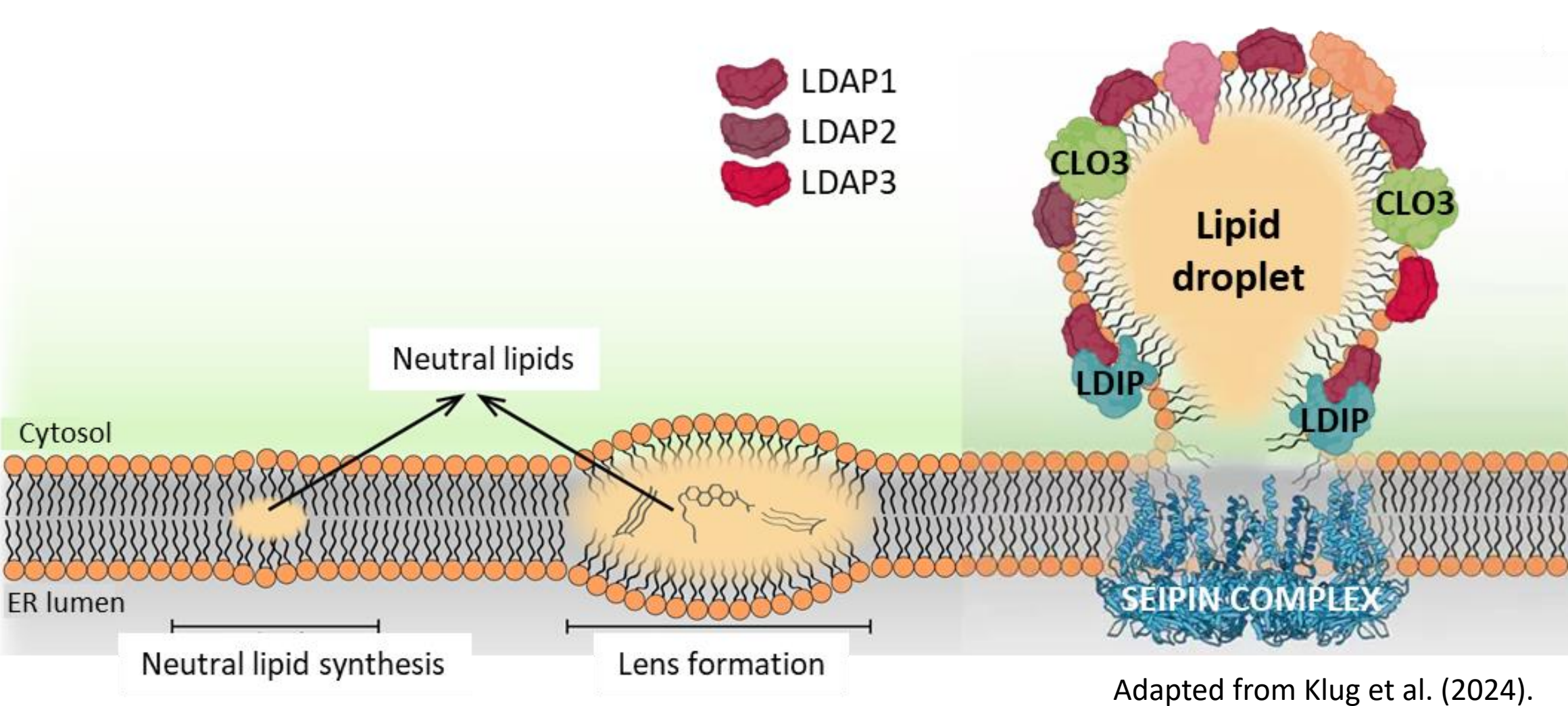
GC-FID analyses on neutral and polar lipids extracts (n=3 to 6) from inoculated leaves (4 dpi) and systemic leaves (7 dpi), and separated via Solid Phase Extraction. Significance was determined with a Dunn post hoc test (0.05 < **P < 0.01)



BORDEAUX METABOLOME

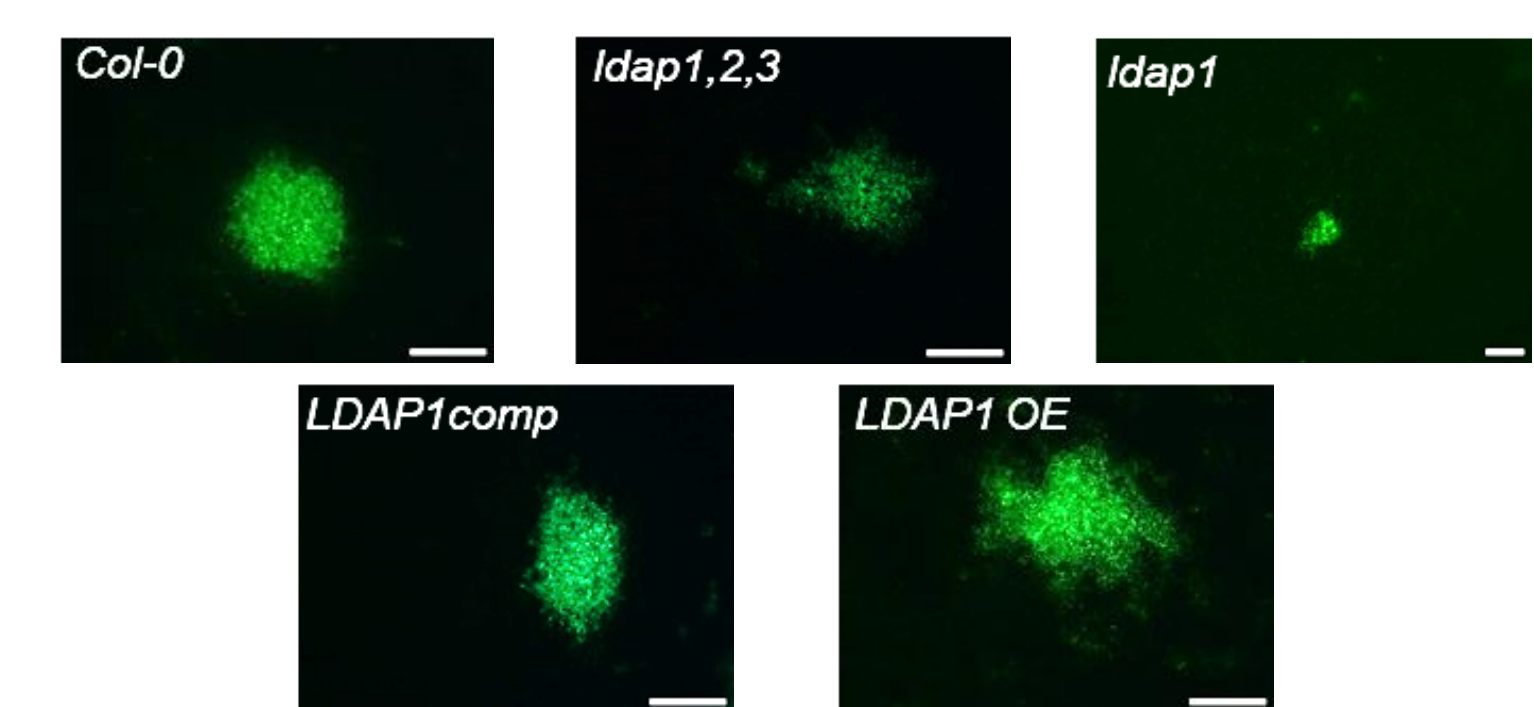
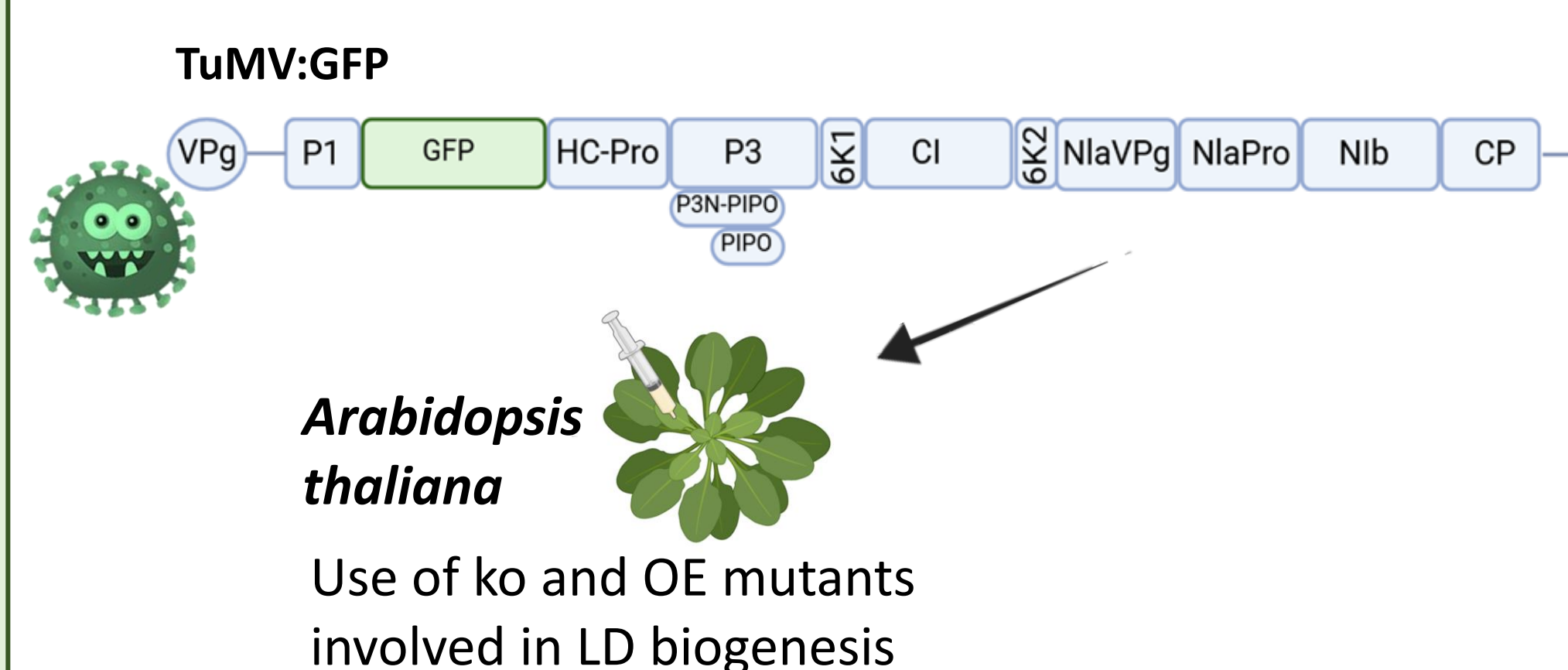
BIC Imagerie du Végétal Bordeaux Imaging Center

LD biogenesis at ER membrane

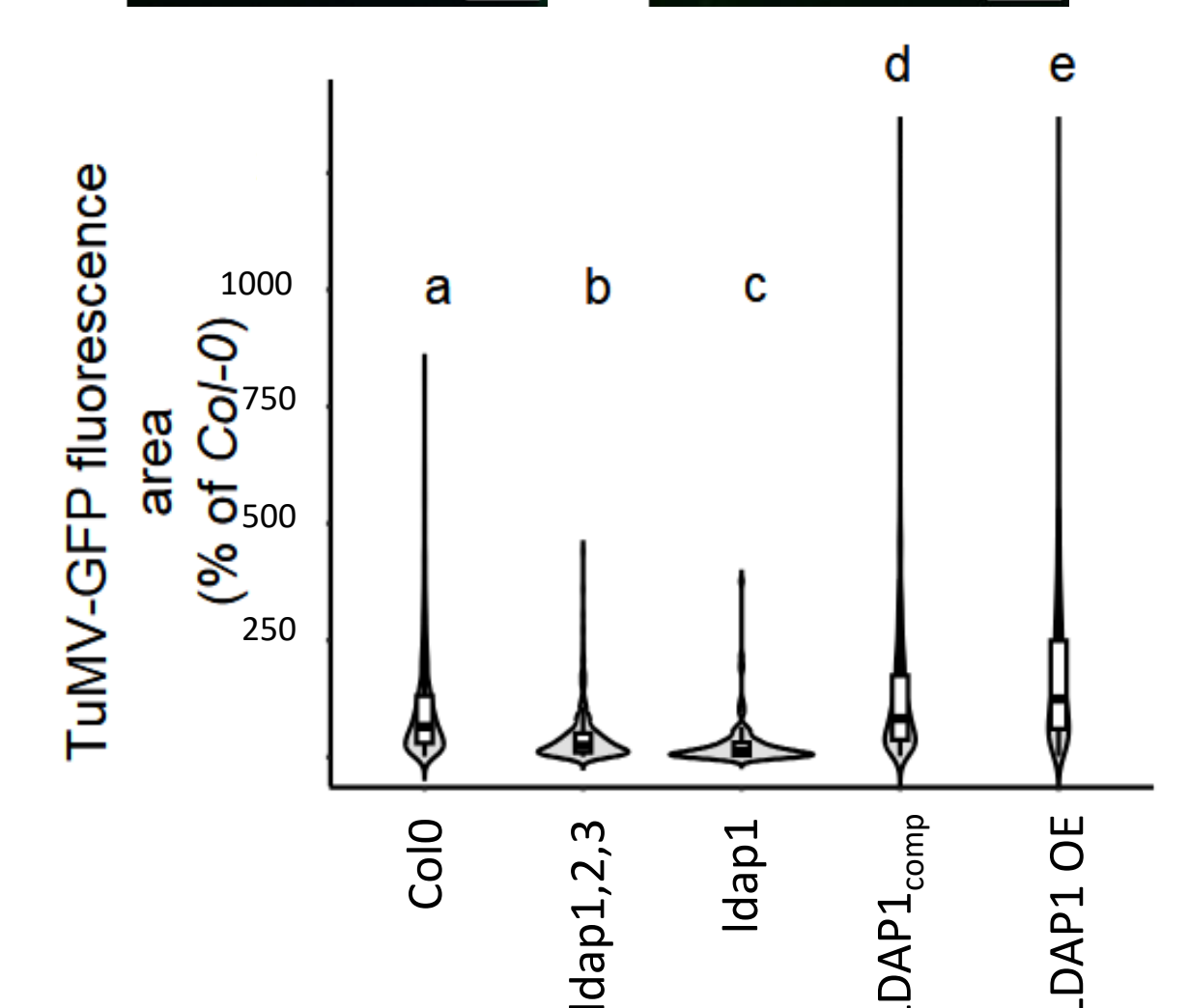


LDs are formed at the ER membrane after neutral lipid accumulation between the two leaflets. LD biogenesis is facilitated by the SEIPIN complex (SEIPIN1, 2 or 3 in Arabidopsis), and LD structure is maintained by Lipid Droplet Associated Proteins (AtLDAP1, 2 or 3). Arabidopsis *seipin* and *ldap* mutants are impaired in LD biogenesis.

TuMV-GFP propagation is affected in Arabidopsis LD biogenesis mutants



Observations of infection foci in Arabidopsis mutants at 5 dpi. The area of infection foci was normalized and expressed in % of the area of TuMV propagation in WT (Col-0) plants. Statistical analyses were performed using Tuckey posthoc test (***) < 0.001 compared to Col0). Scale : 300 μm.



Conclusions

- ✓ Our results highlight an induction of LDs upon viral infection and their recruitment in closed proximity to VRCs.
- ✓ LDs are recruited in closed proximity to viral replication compartments.
- ✓ Our propagation assays in Arabidopsis mutants affected in LD biogenesis suggest a proviral role of LDs during the infection. Their role will be more precisely explored by analysing separately viral replication and viral movement.
- ✓ Further experiments will allow us to identify both viral and host proteins involved in LD accumulation during viral infection. The identification of such candidates represents a first step towards the description of the molecular dynamics leading to plant endomembrane remodelling and LD induction under plant viral infection.