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Evolution of plant-virus Interations under strong environmental stress

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Environmental conditions can perturb the interactions in virus-host systems, driving the interaction through an antagonism–mutualism continuum. Therefore, viruses can be beneficial under certain conditions. A well stablished observation is that under drought conditions virus-infected plants show higher tolerance to water deficiency than non-infected plants. The mechanisms behind this virus-induced tolerance are starting to be investigated, while the mechanism of how this beneficial interaction evolves is still unknown. In our work we seek to study the evolution of a virus (turnip mosaic potyvirus, TuMV) in a plant host under drought stress conditions. To study the interaction, we perform a 5-passage experimental evolution of TuMV. As hosts we used four natural accessions of *Arabidopsis thaliana* that differ in their response to potyvirus infection. The evolution was performed in the hosts with and without drought stress, obtaining drought-evolved viruses and viruses evolved in non-stress conditions. This increase in tolerance provided by the drought-evolved viruses correlates with reduced levels of abscisic and salicylic acid phytohormones in the hosts in comparation with hosts infected with the standard-evolved viruses. There are also differences between the signaling routes that each evolved virus activates or suppresses. This work demonstrates that virus evolution under water deficiency selects for viruses that promote plant survival under such stressful conditions, leading to a mutualistic situation in the virus-host system where the plant has a higher survival when infected and the virus can replicate longer in the host. The evidences suggest that environmental conditions shape the evolution of the virus-host interaction, modifying both the host and virus dynamics and therefore the output of their relationship.