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WATER-STRESS CAN ENHANCE THE TRANSMISSION OF PLANT VIRUSES BY INSECT VECTORS

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BACKGROUND and OBJECTIVES

Drought is one of the major abiotic stresses threatening crop production worldwide and is predicted to be accentuated by global warming. In nature, plant viruses constitute another major constraint and are responsible for tremendous agronomic and socio-economic impacts due to damages and yield losses in almost all cultivated crops. Of particular relevance then are analyses on how climate change will affect the future distribution of infectious disease outbreaks in plants. As a matter of fact, a number of recent studies showed the influence of climate change on plant vector-borne diseases and on their spread, mainly focusing on the effects on the vector biology (e.g. developmental time, fecundity, migration,…) and ecology [1, 2]. However, to our knowledge, there is no study reporting a direct impact of water-stress on changes in virus transmission. In this study, we investigated the effect of a severe water deficit on the transmission rate of two non-circulative transmitted plant viruses.

MATERIAL and METHODS

The aphid-transmissible *Cauliflower mosaic virus* (CaMV) and *Turnip mosaic virus* (TuMV) were propagated on 2 week old-turnip (*Brassica rapa*) plants by mechanical sap inoculation. Two weeks after inoculation, infected source plants were subjected to water withholding during eight days before transmission assays (n = 3 experimental replicates) for each virus tested.

RESULTS

For both viruses assayed, we showed that the transmission rate was significantly increased from source plants subjected to water deficit compared to well-watered plants. A 30-percent increase was observed in CaMV, while in the case of TuMV, transmission results were even more spectacular with a doubled transmission rate in water-stressed plants compared to well-watered plants. However, in both cases the increase in transmission rate could not be explained by an increased virus accumulation in water-stressed source plants.

CONCLUSIONS

Evidences that infected plants subjected to water stress are more likely to transmit viruses may have significant consequences for viral epidemiology in a globally changing environment. While we are currently investigating the biological mechanisms involved in the patterns observed, the results reported provide new insights for the modeling of virus transmission and disease dynamics.

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