

Mutualism or parasitism? The vector's cost of plant virus transmission

Viruses, the submicroscopic infectious particles, rely solely on hosts for multiplication. During the global pandemic, we learnt to avoid unnecessary contact and limit travelling for the sake of limiting the virus spread. As we think about plant viruses, we notice that the relative lack of movement and direct contact between organisms sometimes is not enough. Many plant viruses use other, motile organisms, often herbivorous arthropods, called vectors, to transmit virus particles to new hosts. What is more, viruses can manipulate its vectors to promote their spread and enhance chances of reaching the suitable host. The manipulation can be direct, through changes in vector's organism, or indirect, through changes in plant physiology. The phenomenon is known as the vector manipulation hypothesis.

Viruses are often associated with diseases and perceived as antagonistic towards their hosts and vectors. However, latest studies show that there is vast number of viruses that form neutral or profitable relationships with other organisms, including their vectors, meaning viruses have symbiotic relationships. Do viruses simply take advantage of vectors, or do they offer co-evolutionary benefits to the vector? The latter scenario where viruses and vectors are partners is called mutualistic symbiosis. The insight into the interaction could be useful for controlling crop viruses spread.

Due to existence of multiple modes of plant virus transmission and various life histories of vectors, it would be impossible to provide one universal answer to this question. As many as possible groups of viruses and vectors should be investigated to give insight into virus and vector interactions. The proposed project will focus on costs payed by vector in the study system of *Wheat streak mosaic virus* (WSMV) (Potyviridae: Tritimovirus), its only vector – the wheat curl mite species complex (*Aceria tosichella*) (Acari: Eriophyoidea) and bread wheat (*Triticum aestivum*). The virus can cause up to 100% yield loss in wheat and is a serious threat in the North America. The project will aim at answering the question if WSMV and wheat curl mite relationship is mutualistic or parasitic. The hypothesis that wheat curl mite benefits from the co-evolutionary interaction with the virus. Specifically, mite's fitness (evolutionary measure of success), dispersal rates and changes in feeding behaviour will be measured in the light of WSMV infection. The results will fill the gaps in the knowledge of tripartite interactions of viruses, vectors and hosts, particularly for very close interactions of plant viruses transmitted by mites, a group that was not sufficiently covered by studies yet.