Project title: **Decoding plant virus–vector interactions: how a plant virus alters the behavior of its vector**

Dispersal is a fundamental biological process with wide-ranging ecological and evolutionary consequences. It influences the distribution of species, population structure, gene flow, and the spread of pests and pathogens. In the context of climate change and globalization of agriculture, understanding how organisms move is especially relevant for predicting the expansion of crop pests and plant diseases. While typically studied in larger organisms, tiny species can have outsized impacts, particularly as vectors of plant pathogens.


Photo 1. Aglomeration of *Aceria tosichella* on wheat

The wheat curl mite (*Aceria tosichella*) (WCM) (Photo 1) is a microscopic arachnid that inhabits cereal crops and transmits *Wheat streak mosaic virus* (WSMV) (Photo 2). This virus can cause major yield losses, especially when infection occurs at early growth stages. The mite disperses passively, primarily by wind, and can also spread through movement of plant material or soil. Recent research suggests that viruses like WSMV may influence the behavior and biology of their vectors, effectively increasing their own transmission success.

This project aims to determine whether WSMV alters dispersal-related behaviors in two genetically distinct WCM lineages, MT-1 and MT-8, which differ in their geographic distribution and efficiency as vectors. Three laboratory experiments are planned: (1) measuring passive dispersal in wind tunnel setups under virus-free and WSMV-infected conditions; (2) testing oviposition site choice using dual-choice bioassays with infected and healthy plant material; and (3) evaluating olfactory preferences using Y-tube olfactometers with volatiles from healthy and infected wheat leaves


Photo 2. Symptoms of WSMV on wheat

The results will reveal whether the virus manipulates vector behavior differently depending on the mite's genotype. This information is essential for identifying which lineages pose the greatest epidemiological risk and could guide the development of targeted management strategies—such as breeding virus-resistant wheat varieties, using barrier crops, or applying RNAi-based methods to suppress vector competence.

Ultimately, this project addresses a critical question in plant pathology and vector ecology: how do pathogens exploit the biology of their carriers to persist and spread? The findings will support more sustainable agricultural practices by reducing dependence on chemical pesticides and enhancing our ability to predict and mitigate virus outbreaks in cereal crops. These insights will be valuable not only to researchers, but also to plant breeders and farmers facing growing challenges to food security.