The role of sugars in plant defense against two-spotted spider mite

Sugars play important roles as energy and carbon sources in plants and in the herbivores that often attack them, which are common pests of cultivated crops. Recent data also suggest that sugars act as signaling molecules involved in plants' acclimation to environmental changes, as well as in their defense against biotic stress.

The role of sugars in biotic stress is mainly studied in terms of plant-microbe interactions. However, among arthropods, there are many devastating pests, including two-spotted spider mite (TSSM), a generalist phytophage that attacks over 1100 plant species, and the mechanisms of its interaction with host plants are much less elucidated. It has been shown that within a single plant species, there are individuals more and less susceptible to this pest. Results from our preliminary research indicate that sugars content in leaves may be one of the factors influencing susceptibility to TSSM. Moreover, several sugar-related genes were found in the chromosomal regions where TSSM resistance was mapped. Therefore, host plant proteins involved in sugar sensing, metabolism, and transport may play a significant role during TSSM attack.

The aim of this project is to **identify the contribution of sugars to variation in susceptibility and their role in defense responses of plants attacked by two-spotted spider mites (TSSM; *Tetranychus urticae*)**. This will be achieved through several biochemical and molecular analyses in various accessions of *Arabidopsis thaliana* and maize, which vary in susceptibility to TSSM.

The project includes measurements of sugar content, enzymatic activity, and relative transcript level; and TSSM susceptibility phenotyping of maize and *Arabidopsis* plants. The proposed experiments will demonstrate the role of sucrose, glucose and fructose during TSSM attack in both a model plant, *Arabidopsis thaliana*, and a crop plant, maize, which are host plants for TSSM. The results of this project will contribute to the development of herbivore-resistant plant breeding programs, which are essential for sustainable agriculture.