Evaluation of the video-tracking method as a new approach for phenotyping using *Myzus persicae* and several wild potato species

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Due to climate change and e.g. restriction of pesticide use, aphid populations are increasing. In addition to direct damage, aphids act as virus vectors. Thus, they have a great influence on plant health. Therefore, plant resistance against aphids is a promising approach in terms of integrated pest management. For resistance screening, there exist short-term methods for observing the interaction between plants and aphids, e.g. the Electrical Penetration Graph Technique (EPG), which focuses on feeding behaviour. Other methods such as insect fitness assays observe the interaction on a long term view. With all the methods, the information gain is enormous, but they are time and labor intensive. Thus, the gap between the throughput of genotyping methods and phenotyping methods is enormous and there is a need for new phenotyping methods.

In this context, we wanted to evaluate the recently introduced video-tracking technique (VT) for aphids and potatoes. This technique tracks the activity (moved distance) of the insects on leaf discs. Previous studies demonstrated, that the aphid's moved distance in a certain timespan and the resistance status of the plants correlate positively. Furthermore, the feeding behavior (EPG) of *Myzus persicae* was investigated to include an established method. There we were focus especially on the duration of the sieve element (SE) sap consumption. If an aphid consumes only a short time or even never SE sap, a plant is classified as resistant. A classification of genotypes (resistant or susceptible) was made for each method and the order of classification was then compared.

For the tests we selected wild potatoes show a huge phenotypic variation, including glandular trichomes on the leaf surface whose secretions may negatively affect aphid attraction, as potential resistance resources. Seven wild potato species (*Solanum bulbucastanum, S. verrucosum, S. chacoenese, S. andigena, S. pennitasectum*, *S. etuberosum, S. stoloniferum*) and one susceptible cultivar as control (*Desiree*) were used in that study.

For both technical approaches, we detected differences for different wild potato species, indicating resistance against *M. persicae*. In addition, the order of genotypes in terms of resistance resistance status was the same for both techniques. Aphid movement was higher on potato genotypes where the duration of the SE-ingestion was shorter compared to the other genotypes, and the other way around. So, we were able to validate VT as a new useful medium to do high-throughput phenotyping for research on aphid resistance in potato.