Nothing in nature is free. All organisms must constantly make decisions that are related with costs and benefits, and the difficult art of compromise accompanies them throughout their whole lives. Evolutionary trade-offs – situations where increase in one adaptation component causes the simultaneous decrease in another, play a significant role in biology. For example, high fecundity leads to a shorter lifespan. In parasites, high degree of host specialization allows for effective exploitation of the host, but simultaneously limits the number of possible hosts. The understanding of the mechanisms associated with the adaptation of herbivorous parasites to their hosts is of particular importance in the case of economically significant organisms. One of the important herbivorous parasite is *Aceria tosichella* (wheat curl mite: WCM), which is an invasive mite that inhabits grasses, mainly wheat. Currently, it is commonly found in cereal crops on all continents, causing a great challenge for both food producers and researchers. In fact, WCM is a complex of genetically distinct biotypes differing in host specificity, making the study even more challenging.

The aim of this project is to discover the evolutionary compromises arising during the adaptation of the parasite to the host. This study will allow for better understanding of the costs of host specialization, for the tracking of morphological responses, and for identification of genes associated with the process of host specialization.

The research will be conducted on the most invasive and polyphagous biotype MT-1 of the WCM complex. Adaptations to the host will take place on the path of experimental evolution in three independent experimental treatments. Two of them will rely on breeding specialists, and one on breeding generalist. During the experiment, all three experimental treatments will undergo periodic tests to check the fitness of the mites to host plants, as well as morphological and genetic changes related to the adaptation process.

This approach will allow to present and describe the trajectory of phenotypic and genotypic changes that will be the result of adaptation to the host. In addition to general and comprehensive knowledge about changes occurring during adaptation to the host, this project will provide knowledge which will help to understand the mechanisms involved in host shifting, range increasing, and invasive potential of WCM.