Aphid defense strategies, symbiotic dynamics and the role of transposable elements in parasitoid interactions

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Abstract

Parasitoids exert strong selective pressure on their hosts, leading to the evolution of defensive traits in aphids to thwart successful parasitism. The interplay of symbiotic associations also influences the evolution of defenses against natural enemies. Parasitism experiments with *Diaeretiella rapae* and *Myzus persicae* aphid isolines, infected or not with the secondary symbiont *Rickettsia*, showed variable parasitism success rates ranging from 43% to 76%. Six *M. persicae* isolines (three with high parasitism rate; three with low parasitism rate) were selected for biological analysis and evaluation of parasitoid behavior during patch exploitation and aphid defensive behavior during parasitoid interactions. Biological parameters revealed remarkable differences among *M. persicae* isolines, which responded differently to parasitism, suggesting potential adaptive costs associated with lower parasitism rates. Furthermore, it was observed that the secondary symbiont *Rickettsia* does not confer additional defense mechanisms to *M. persicae* against *D. rapae*. Behavioral studies revealed differences in the occurrence of host evaluation between low and high parasitism isolines. Specifically, the presence of Rickettsia was found to affect the defensive behavior of *M. persicae* in response to parasitoid attack, thereby interfering with the host selection process of the parasitoid *D. rapae*. Phenotypic differences observed in response to parasitism by *D. rapae* in the *M. persicae* isolines studied, as well as in biological and behavioral assays, could be attributed to genetic variability. We hypothesize that transposable elements (TEs) might be involved as a selective force and contribute to the accumulation of mutations within the host, and potentially assist in host defense responses. Therefore, the aim of our research was to detect and annote TEs in the six different clonal lines, and to verify whether they are associated with genes involved in host immune responses against the presence of macro-invaders, such as parasitoids.

Keywords: Host, parasitoid interactions, Transposable elements, Host adaptability

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