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Coevolutionary fine-tuning: evidence for genetic tracking between a specialist wasp parasitoid and its aphid host in a dual metapopulation interaction

F.N. Nyabuga[1,2†]*, H.D. Loxdale[1,2], D.G. Heckel[2] and W.W. Weisser[1]

[1]Institute of Ecology, Friedrich Schiller University, Dornburger Strasse 159, 07743 Jena, Germany: [2]Department of Entomology, Max Planck Institute for Chemical Ecology, Hans-Knöll-Strasse 8, 07745 Jena, Germany

Abstract

In the interaction between two ecologically-associated species, the population structure of one species may affect the population structure of the other. Here, we examine the population structures of the aphid *Metopeurum fuscoviride*, a specialist on tansy *Tanacetum vulgare*, and its specialist primary hymenopterous parasitoid *Lysiphlebus hirticornis*, both of which are characterized by multivoltine life histories and a classic metapopulation structure. Samples of the aphid host and the parasitoid were collected from eight sites in and around Jena, Germany, where both insect species co-occur, and then were genotyped using suites of polymorphic microsatellite markers. The host aphid was greatly differentiated in terms of its spatial population genetic patterning, while the parasitoid was, in comparison, only moderately differentiated. There was a positive Mantel test correlation between pairwise shared allele distance (*DAS*) of the host and parasitoid, i.e. if host subpopulation samples were more similar between two particular sites, so were the parasitoid subpopulation samples. We argue that while the differences in the levels of genetic differentiation are due to the differences in the biology of the species, the correlations between host and parasitoid are indicative of dependence of the parasitoid population structure on that of its aphid host. The parasitoid is genetically tracking behind the aphid host, as can be expected in a classic metapopulation structure where host persistence depends on a delay between host and parasitoid colonization of the patch. The results may also have relevance to the Red Queen hypothesis, whereupon in the 'arms race' between parasitoid and its host, the latter 'attempts' to evolve away from the former.

Keywords: aphid, *Metopeurum fuscoviride*, hymenopterous parasitoid, *Lysiphlebus hirticornis*, tansy plant, *Tanacetum vulgare*, specialist, genetic variability, genetic tracking, metapopulation

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*Author for correspondence
Fax: +46-40-46 21 66
E-mail: franklin.nyabuga@slu.se
†Current address: Department of Plant Protection Biology, Swedish University of Agricultural Sciences, Box 102, SE-230 53 Alnarp, Sweden