Effect of the spatial distribution of resources in experimental minilandscapes on the fitness of two populations of Trichogramma cacoeciae.

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Abstract

Parasitoids in genus *Trichogramma (*Hymenoptera*)* are minute size (less than 1 mm) wasps that lay eggs in the eggs of other insect species. They have been used in biological control for decades to contain Lepidoptera pest populations in many different crops. They may adapt their behaviour to maximize their performance at finding their host eggs, which are a patchy and heterogeneously distributed resource. To understand how Trichogramma are affected by the spatial distribution of their resource, we assembled experimental minilandscapes in two dimensions. We created different resource distributions varying the degree of spatial autocorrelation (aggregation) of *Ephestia kunhiella* eggs, keeping average egg density constant. We studied two populations of *Trichogramma cacoeciae*, the first (PJ) maintained under laboratory conditions for more than twenty years and the second (WT) sampled in the field in 2014. For each population we determined parasitism performance (fitness) and monitored individual movements over the landscapes using high-resolution pictures over the entire foraging sequences (five hours). We found that resource spatial distribution had a strong impact on fitness for both populations, but that the two populations responded in different ways: PJ was more efficient than WT when egg distribution was either very homogeneous or very heterogeneous (aggregated), whereas WT was more efficient than PJ at intermediate levels of spatial autocorrelation. We will show how these fitness differences can be explained from differences in the underlying individual behaviours and movement patterns.

Keywords: optimal foraging, mini landscape, trichogramma, patch, picture analysis

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