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Parasitoid wasp usurps its host to guard its pupa against hyperparasitoids and induces rapid behavioral changes in the parasitized host

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Abstract

Some parasites have an ability to fabricate the behavior of their host and impel the host to guard parasites' offspring, which is popularly called as bodyguard manipulation. *Psalis pennatula* larva parasitized by a braconid parasitoid wasp *Microplitis pennatula* exhibits some behavioral changes including the guarding of the parasitoid pupa from its natural enemies. We hypothesized that these behavioral change exhibited by the parasitized host larva are induced by the parasitoid and can be considered as an example of bodyguard manipulation. Even though hyperparasitoids are the more specialized natural enemy of parasitoids than predators, very few studies tested the success of guarding parasitoid pupa against hyperparasitoids. This study analyzed the success of guarding behavior of the parasitized host against hyperparasitoids. The onsets of parasite-induced phenotypic alterations (PIPAs) in the parasitized host were inspected to analyze whether these behavioral changes in the host larva manifests gradually or abruptly. The study concludes that parasitized host larva defends the parasitoid pupa from hyperparasitoids and the PIPAs in the parasitized host develops abruptly only after the egression of parasitoid prepupa.

Introduction

Many parasites modulate the behavior and physiology of hosts for their survival and successful transmission [1]. This type of manipulation is otherwise known as the extended phenotype, where the gene of one organism has phenotypic effects in another organism [2]. Broadly, reported manipulations are of four types: (i) parasitism that lead the intermediate infected hosts to become more vulnerable to predation by its definitive hosts; e.g.: *Toxoplama gondii* infected rats become allured towards odor of cats despite its innate aversion [3]; (ii) parasites guide their hosts to atypical habitats which are suitable for the effective transmission of parasites' propagules; e.g. 'Suicide' of *Paragordius tricuspidatus*-parasitized *Nemobius sylvestris* in water bodies [4]; (iii) some parasites modulates feeding behavior of hosts, which act as their