



Insecticide-induced hormesis in a factitious host, *Corcyra cephalonica*, stimulates the development of its gregarious ecto-parasitoid, *Habrobracon hebetor*

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HIGHLIGHTS

- Sublethal concentrations of deltamethrin induce hormesis in the factitious host *Corcyra cephalonica*.
- Enhanced performance of the parasitoid *Habrobracon hebetor* was observed on the hormetic host *C. cephalonica*.
- These observations might be helpful in mass rearing of *H. hebetor* as a biocontrol agent.

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ABSTRACT

Hormesis phenomena in insect pests can have a negative impact, but for beneficial insects, it might be used to optimize mass rearing and increase the quality of biocontrol agents. Here, we report the multigenerational stimulatory effects of deltamethrin in a factitious laboratory host, *Corcyra cephalonica*, and the subsequent performance of its parasitoid, *Habrobracon hebetor*. The effects of sublethal (LC₁₀), low lethal (LC₁₅, LC₂₀, LC₂₅ and LC₃₀) and median lethal (LC₅₀) concentrations of deltamethrin along with the control were evaluated on biological traits and nutrient reserves of the host for three consecutive generations (G0, G1, and G2). The biological traits of *C. cephalonica* (fecundity, developmental duration and larval weight gain) did not differ significantly in the parental generation (G0), whereas in the later generation (G2), significant differences were observed with the control. Nutrient reserves (protein and lipid content) in *C. cephalonica* were significantly influenced by sublethal concentrations in all three generations (G0, G1, and G2). The performance of *H. hebetor* on the factitious host *C. cephalonica* (G2) revealed a significant increase in parasitoid fecundity of 65% when host larvae were exposed to LC₁₅. However, no difference in hatch and pupation rates of parasitoids were observed across treatments. The emergence of both males and females and the longevity of only female wasps were significantly different. No effects were observed on male longevity. Taken together, insecticide-induced hormesis in host *C. cephalonica*, especially at LC₁₅ exposure, stimulates the development of parasitoid *H. hebetor* without obvious major trade-off. The results might be helpful in mass rearing of *H. hebetor* as a biocontrol agent.

1. Introduction

Agricultural insects are generally exposed to insecticides through

direct application or ingestion through food or residual contact (Stark and Banks, 2003; Desneux et al., 2005, 2007). Apart from lethal effects, chemical insecticides can have sublethal effects in exposed arthropods

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