Thermal plasticity potentially mediates the interaction between host *Chilo partellus* Swinhoe (Lepidoptera: Crambidae) and endoparasitoid *Cotesia flavipes* Cameron (Hymenoptera: Braconidae) in rapidly changing environments

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Abstract

BACKGROUND: Increasing climatic average temperatures and variability elicit various insect physiological responses that affect fitness and survival and may influence subsequent trophic interactions in agroecosystems. In this background, we investigated short- and long-term plastic responses to temperature of the laboratory-reared stemborer *Chilo partellus* and its larval endoparasitoid *Cotesia flavipes*.

RESULTS: Rapid cold- and heat-hardening effects in *C. partellus* larvae, pupae and adults and *C. flavipes* adults were highly significant ($P < 0.001$). High-temperature acclimation improved critical thermal limits and heat knockdown time in *C. partellus* larvae and *C. flavipes* adults, respectively. Low-temperature acclimation enhanced the supercooling point in *C. flavipes* and the chill coma recovery time in both *C. partellus* larvae and *C. flavipes* adults.

CONCLUSION: The results of this study suggest that thermal plasticity may enhance the survival of these two species when they are subjected to lethal low and high temperatures. However, *C. partellus* appeared to be more plastic than *C. flavipes*. These results have three major implications: (1) *C. partellus* may inhabit slightly warmer environments than *C. flavipes*, suggesting a potential mismatch in biogeography; (2) host–parasitoid relationships are complex and are probably trait dependent, and (3) host–parasitoid differential thermal plastic responses may offset biocontrol efficacy. These results may help inform biocontrol decision making under conditions of global change.