

PROLONGED EXPOSURE OF BED BUGS TO SUB-LETHAL TEMPERATURES; MORTALITY, STERILIZATION, FERTILITY RESTORATION AND OFFSPRING EFFECTS

BJØRN ARNE RUKKE, ANDERS AAK AND KRISTIN SKARSFJORD EDGAR

Norwegian Institute of Public Health – Department of Pest Control. Lovisenberggata
8, Pb. 4404 Nydalen, NO-0456 Oslo, Norway

Abstract The bed bugs comeback as a pest has revitalized research on several aspects of its biology to improve management. Temperature can be manipulated to control bedbugs, but has so far been focused on temperature extremes with mortal outcome. The present study focuses on exposure of bedbugs to temperatures of a sub-lethal character, and point at its potential application in the struggle against this culprit. We exposed adult bed bugs for 34.0, 35.5, 37.0, 38.5 or 40 °C for 3, 6 or 9 days. 40 and 38.5 °C induced 100% mortality when exposed for extended time, whereas 34 °C had no observable negative effect on bedbugs. The sub-lethal temperatures did however interact with time to induce intermediate or low levels of mortality and had distinct effects on fertility. The number of eggs produced, the hatching rate of the eggs and the following nymphal feeding and moulting success decreased by increased temperature and prolonged exposure. The fertility remained low for up to 40 days after heat exposure, and the time until fertility restoration was strongly connected to the time and temperature exposure. Offspring originating from the populations with restored fertility also suffered from reduced ability to moult. This may indicate involvement of the ovarial transferred bacterial symbiont, *Wolbachia*, in the mechanism behind the observed temporary sterilization and reduced offspring survival. Finally, eggs produced by untreated populations at 22 °C were exposed for 34.0, 35.5 or 37.0 °C for 3 or 6 days to investigate egg mortality at relevant temperatures. Our study shows that raising temperatures to between 35 and 40 °C for different periods of time will influence bed bug population dynamics negatively. This may be utilized in professional pest management to worsen conditions for bed bugs to reduce infestation size and potential comeback after treatment. The role of this rather cheap measure ought to be further investigated both as a part of pest managers arsenal against bed bugs, but also as a potential tool in “do-it-yourself” eradication.