Improvement of heat and desiccation tolerance of the entomopathogenic nematode *Heterorhabditis bacteriophora* through selective breeding

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Heat and desiccation contributed to reduced shelf life biological control products containing the entomopathogenic nematode *Heterorhabditis bacteriophora*. In order to enhance heat and desiccation tolerance, this study assessed 36 natural populations and 18 hyrid or inbred lines of *H. bacteriophora* on their response to high temperatures and desiccation stress. The mean heat tolerance without inclusion of an adaptation phase ranged between 33.3 to 40.1°C, with adaptation from 34.8 to 39.2°C. The mean desiccation tolerance without inclusion of an adaptation phase ranged between the water actvity a_w= 0.9 and 0.95 and with adaptation from 0.67 to 0.99. Adaptation resulted in an increase of the heat and desiccation tolerances of each strain. Hybridisation of the most tolerant strains further increased tolerance. Eleven selection steps with the hybrid resulted in increase tolerance from 39.3° to 43.0°C with adaptation and from 39.5° to 44°C without adaptation. Through six selection steps the tolerated a_w-value did not go beyond 0.65 whether nematodes had been adaptated to desiccation stress or not. Desiccation stress (a_w-value of 0.85 for 24 h) had a negative effect on hybrid strain´s infectivity to the insect *Galleria mellonella.* Temperature stress (40°C or 0°C for 24 h) had less pronounced effects on *H. bacteriophora.* Hybrid strains selected for enhanced tolerance after an adaptation to stress were generally better in fitness compared to those for which adaptation prior to stress exposure was excluded.