Hub | ScienceDirect | Scopus | Applications Register | Login Go to SciVal Suite

You have Guest access to ScienceDirect Find out more...

Home Publications Search My settings My alerts Shopping cart Help

Export citation Purchase More options... Search ScienceDirect Search

Ecotoxicology and Environmental Safety

Volume 74, Issue 4, May 2011, Pages 800–810

Chitobiase activity as an indicator of altered survival, growth and reproduction in *Daphnia pulex* and *Daphnia magna* (Crustacea: Cladocera) exposed to spinosad and diflubenzuron

Claire Duchet[a, b], Marilia Mitie Inafuku[b, 1], Thierry Caquet[b], Michel Larroque[c], Evelyne Franquet[d], Christophe Lagneau[a], Laurent Lagadic[b]

[a] Entente Interdépartementale de Démoustication du Littoral Méditerranéen, 165 avenue Paul-Rimbaud, F-34184 Montpellier, France

[b] INRA, UMR985 Écologie et Santé des Écosystèmes, Équipe Écotoxicologie et Qualité des Milieux Aquatiques, Agrocampus Ouest, 65 rue de Saint Brieuc, F-35042 Rennes, France

[c] Laboratoire de Chimie Analytique, UMR Qualisud, Faculté de Pharmacie, Université Montpellier I, 15 Avenue Charles-Flahault, BP14491, F-34093 Montpellier Cedex 5, France

[d] Université Paul Cézanne, Institut Méditerranéen d'Écologie et de Paléoécologie, Faculté des Sciences et Techniques Saint Jérôme, C31, F-13397 Marseille, France

http://dx.doi.org/10.1016/j.ecoenv.2010.11.001, How to Cite or Link Using DOI
Permissions & Reprints

View full text

Purchase $31.50

Abstract

Chitobiase is involved in exoskeleton degradation and recycling during the moulting process in arthropods. In aquatic species, the moulting fluid is released into the aqueous environment, and chitobiase activity present therein can be used to follow the dynamics of arthropod populations. Here, chitobiase activity was used for monitoring the impact of mosquito candidate larvicides on *Daphnia pulex* and *Daphnia magna* under laboratory conditions. Both species were exposed to spinosad (2, 4, 8 μg L^{-1}) and diflubenzuron (0.2, 0.4, 0.8 μg L^{-1}) for 14 days. *Bacillus thuringiensis* var. *israelensis* (*Bti*; 0.25, 0.5, 1 μL L^{-1}) was used as the reference larvicide. Chitobiase activity, adult survival, individual growth and fecundity, expressed as the number of neonates produced, were measured every 2 days. Average Exposure Concentrations of spinosad were ten-fold lower than the nominal concentrations, whereas only a slight deviation was observed for diflubenzuron. In contrast to *Bti*, spinosad and diflubenzuron significantly affected both species in terms of adult survival, and production of neonates. As compared to *D. pulex*, *D. magna* was more severely affected by diflubenzuron, at low and medium concentrations, with reduced adult growth and much lower chitobiase activity. Chitobiase activity was positively correlated with the individual body length, number of neonates produced between two consecutive observation dates, and number of females and neonates. In addition, the significant positive correlations between chitobiase activity measured on the last sampling date before the first emission of neonates and the cumulative number of neonates produced during the whole observation period strongly support the potential of the activity of this chitinolytic enzyme as a proxy for assessing the dynamics of arthropod populations exposed to larvicides used for mosquito control.

Keywords

Daphnia sp.; Neurotoxicant; Insect growth regulator; *Bti*; Chitobiase; Population dynamics; Bioindicator; Environmental risk assessment

Figures and tables from this article:

Fig. 1. Time-change in the mean (+SE; n=15) numbers of adults and neonates and mean (±SE; n=15) chitobiase activity in control *Daphnia pulex* and *Daphnia magna* during the observation period.

Figure options