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CHRONIC TESTING OF LOTIC INVERTEBRATE SPECIES

CONTACT

M.Sc. Maria Brüggemann
Tel: +49 2972 302-438
Maria.brueggemann@ime.fraunhofer.de

Fraunhofer Institute for Molecular Biology and Applied Ecology IME,
Applied Ecology and Bioresources Division
Auf dem Aberg 1
57392 Schmallenberg, Germany
Tel: +49 2972 302-0
Fax: +49 2972 302-319

Division Head Applied Ecology and Bioresources,
Prof. Dr. Christoph Schäfers
http://www.ime.fraunhofer.de

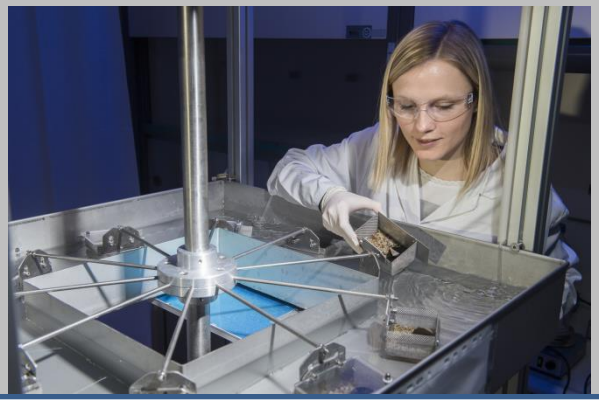
FRAUNHOFER IME
APPLIED ECOLOGY AND BIORESOURCES DIVISION

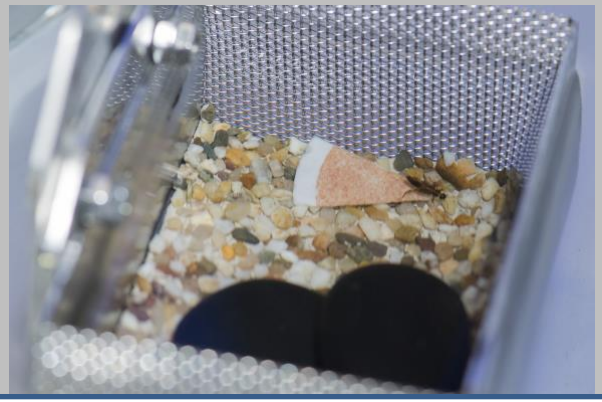
The overall aim of the Applied Ecology and Bioresources Division is to investigate and assess the risks presented by synthetic chemicals and natural substances towards ecosystems, and towards humans via contaminated food, feed and consumer products.

Our current topics and business areas are:

- Environmental Risk Assessment of Substances
- Food Safety and Quality
- Sustainable Agricultural Production of Substances
- Bioresources for the Bioeconomy
- Insect Biotechnology

CHRONIC TESTING OF INSECT LARVAE FOR RISK ASSESSMENT USING THE SINGLE SPECIES DISTRIBUTION (SSD) CONCEPT





Background

Species Sensitivity Distributions (SSDs) are increasingly used in ecological risk assessment of chemicals, especially in the scope of regulation. SSDs compile toxicity data for a set of species tests to estimate hazardous concentrations (HC_x). which represent a specific proportion of species in a community that would be affected. For the risk assessment of plant protection products tests for at least five (vertebrates) or eight species (invertebrates, algae, or plants) of the sensitive taxonomic group are required for the SSD approach.

Until now, most invertebrate SSDs for plant protection products are based on acute test data because to conduct for example chronic tests with eight different aquatic arthropoda species is difficult. The Fraunhofer IME is able to perform chronic testing of different invertebrate species which could provide toxicity data for the SSD approach:

Lumbriculus variegatus (Lumbriculida),
Potamopyrgus antipodarum, Lymnea stagnalis (Gastropoda),
Daphnia magna (Cladocera),
Hyallella azteca (Amphipoda),
Asellus aquaticus (Isopoda) and
Chironomus riparius (Diptera).

Justification for testing of organisms present in running waters

In order to broaden the spectrum of possible tests we developed a new testing method for lotic insect larvae. Some insects, especially Ephemeroptera, Plecoptera and Trichoptera, are mainly found in running waters and could be highly sensitive against for example insecticides. Therefore, testing with insects from running waters provides important information for risk assessment. We developed a test system for the chronic testing of lotic invertebrates. For a pilot study field collected larvae (*Protonemura sp.*), adapted to laboratory conditions before the test start, were used. An overview of the diversity and availability of organisms during the course of the year is available.

Figure 1: Mayfly (Ephemeroptera), stonefly (Plecoptera) and caddisfly (Trichoptera) larvae used for the chronic testing.

Test system

The test system mimics the natural habitat conditions of lotic insect larvae regarding flow, temperature, oxygen level, light intensity and food supply. Contrary to usual indoor stream systems, not the water body itself but vessels inside the test containers are moved and circulate through each treatment to obtain the target flow.

Test design

The test design consists of up to six treatment levels with ten pseudoreplicates. Each replicate serves as an individual compartment including one larva.
As endpoints growth, emergence and mortality of the individual test organisms are determined during the test course of 21 days.
Besides a semi-static exposure, a test under flow-through exposure conditions or with peak exposures is possible.

The applicability of the test system has already been proved with a pilot study with the stonefly *Protonemura sp.* exposed to the neonicotinoid Imidacloprid.