

The Species Sensitivity Distribution approach in the risk assessment for pesticides

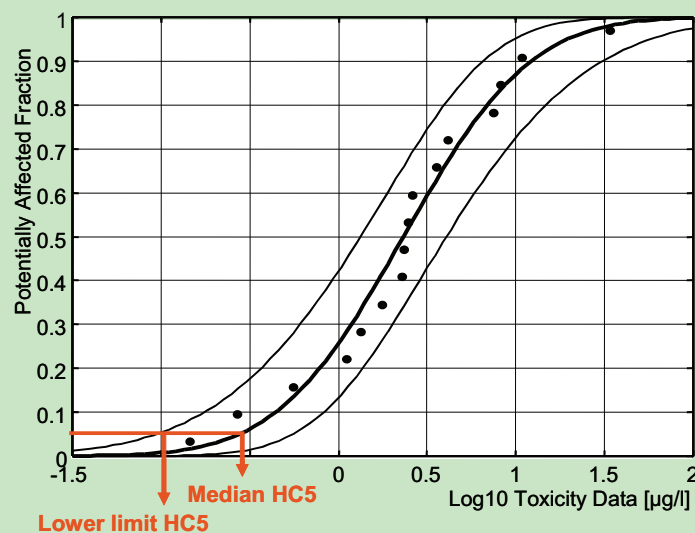
Theme: Risk assessment procedures for registration of plant protections products BO-06-010-001

Problem

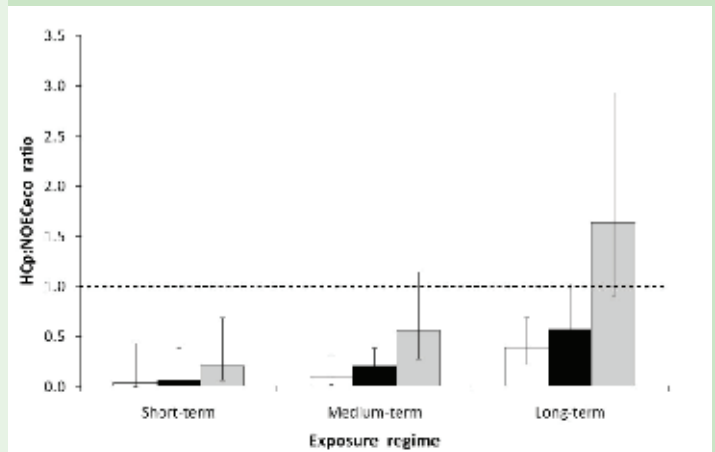
Species Sensitivity Distributions (SSDs) make use of available laboratory toxicity data. They enable estimates to be made of the proportion of the species affected at different exposure concentrations (e.g. HC1 or HC5, the hazardous concentration to 1% or 5% of the tested taxa, respectively), and they can be shown together with confidence limits (Figure right). But how predictive is the HC1 or HC5 for effects in the field? The research focused on the comparison of the HC1 and HC5 with threshold levels of effects in aquatic micro-/mesocosm tests.

Approach

In previous years attention was paid to SSDs for insecticides and herbicides. In 2009 the focus was on SSDs for fungicides. A dataset was compiled comprising acute single species toxicity data and concentration-response relationships from micro-/mesocosm studies. The analysis presented here includes information for 10 insecticides, 9 herbicides and 9 fungicides. Detailed information can be found in Maltby et al. (2009) and literature cited therein.



Graphical presentation of the species sensitivity distribution curve, its 90% confidence interval, and the derivation of the lower limit and median hazardous concentration to 5% of the species (HC5).



Mean ratio [and 95% confidence interval] between lower limit HC5 and NOECeco (white bars), HC1 and NOECeco (black bars) or HC5 and NOECeco (gray bars) derived from 28 semi-field studies with 26 pesticides. The 1:1 HCp: NOECeco ratio is denoted by the dotted line. The NOECeco is the threshold concentration for adverse effects in micro-/mesocosms.

Results

When SSDs were constructed with acute toxicity data of the sensitive taxonomic groups (usually arthropods for insecticides, plants for herbicides and a wider array of taxa for fungicides) the derived median HC5 values divided by an Assessment Factor of 3, the lower limit HC5 values and the median HC1 values were protective of adverse effects in aquatic micro-/mesocosm studies treated once or repeatedly with the pesticide.

Future use in risk assessment

In the risk assessment the median HC5 values can be used as regulatory acceptable concentrations (RACs) for:

- Short-term exposures (single pulse DT50 < 10 d)
- Longer-term exposures (repeated pulses) if an additional Assessment Factor of 3 is used (figure left)

Maltby L, Brock TCM, Van den Brink PJ (2009). Fungicide risk assessment for aquatic ecosystems: Importance of interspecies variation, toxic mode of action, and exposure regime. *Environ. Sci. Technol.* 43:7556-7563

Lorraine Maltby, Theo Brock & Paul van den Brink

Contact: Theo Brock

Alterra

P.O. Box 47, 6700 AA Wageningen

T +31 317 48 18 49 - F +31 317 41 90 00

theo.brock@wur.nl - www.alterra.wur.nl

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