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The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

TECHNICAL BRIEF

Ecotoxicity

Updating the national salts toxicity database

A newly-completed Water Research Commission (WRC) study has updated the national salts toxicity database.

Background

Salinisation is an important problem facing freshwater resource managers in South Africa. Data on macroinvertebrate responses to salts strongly informed water quality management strategies but the national salts toxicity database has not been updated for over a decade.

Additionally, upsurge of complex chemical mixtures in the environment in recent years meant that the call to update the database was very important for freshwater protection.

Therefore, the main objective of this project was to update the database. Noting that the database contains only data on single salts with nothing on salt mixtures, this project also generated binary salt mixtures data for the database.

Methodology

Key toxicological importance major salts (TIMS) including magnesium sulphate ($MgSO_4$), magnesium chloride ($MgCl_2$), and sodium sulphate (Na_2SO_4), as well as binary mixtures of $NaCl+Na_2SO_4$, $MgCl_2+MgSO_4$, $NaCl+MgSO_4$ and $MgCl_2+Na2SO_4$ were exposed to juvenile and adult stages of the indigenous South African freshwater shrimp *Caridina nilotica*.

Short-term lethal tests (96 h) and long-term lethal tests (240 h) static experimental methods were used to determine the lethal concentration values of the test salts for juvenile and adult shrimps. Based on the principles, theories and outcome of the binary mixture experiments, a procedure for conducting salt mixture experiments was developed.

The mortality data for both 96 and 240 h exposure tests were used to estimate LC50 values for the various salts and salt mixtures.

Main results

In summary, conducting a binary salt mixture experiments may be done according to the following procedure:

1. Determining what type of binary mixture experiment to do base on similar or dissimilar cations of the single salts involved.
2. Determining the concentrations of binary salt mixtures by determination of LC50s separately for single salts in a binary salt mixture.
3. Determination of the relative toxic unit (RTU) of the mixture using the LC50s of the two salts by calculating and adding the relative toxic fractions (RTFs).
4. Estimation of concentration range and proportion of individual single salts in the salt mixture.
5. Apply standard exposure methods such as 96 h static non-renewal for short-term and
6. 240 h static renewal for long-term.

Conclusions

Toxicity data for both single and binary salt mixture were generated and attached as appendices to this report. Data generated are attached as appendices to this report and ready to be added to the national salt toxicity database host by the Unilever Centre for Environmental Water Quality, Institute for Water Research, Rhodes University.

Further reading:
To order the report, *Generation of new ecotoxicity data for salts using indigenous South African freshwater macroinvertebrate: Updating the national salts toxicity database* (**WRC Report No. KV 353/16)**, contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.