

Species Sensitivity Distributions for Ecotoxicological Risk Assessment: elaboration of a shiny app to facilitate data analysis

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Living organisms have different sensitivities to toxicants. This variability can be represented by constructing a species sensitivity distribution (SSD) curve, whereby the toxicity of a substance to a group of species is described by a statistical distribution. Building the SSD curve allows calculating the HC5, that is, the concentration at which 5% of the considered species are affected. The HC5 is widely used as an environmental quality criterion and a tool for ecological risk assessment.

The objectives of the present work were (1) to develop a user interface using the shiny package, (2) generate a graphic as visualization to evaluate for which pesticides there is enough data for the calculation of the SSD curve, (3) allow the user to apply quality criteria to the database, (4) to estimate the HC5 for a number of pesticides from a user provided toxicological database. We present the completed work here.

The first tab allows the user to upload or complete their own database that can consist of several toxicological endpoints for different pesticides. The second tab of the user interface is used for visualization of the number of species for which toxicological data is available for each pesticide in the dataset. The number of data points available at every case is important as there is a minimum sample size for building a valid SSD curve. After selecting the pesticide and animal groups, the user can filter and select subsets of data from the whole database by applying different quality criteria, (e.g., if the studies reported a chemical confirmation of the concentrations of pesticide tested). The final SSD curve is fitted to different distributions using the package `fitdistrplus`. The HC5 is estimated by the distribution presenting the best goodness of fit.

By facilitating and streamlining species toxicity data analysis and the creation of SSD curves, the user interface proposed here should be useful for environmental managers and regulators conducting ecological risk assessments.