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Conference Abstract

# Predictive ecological risk assessment of pesticide mixtures in Mediterranean porous aquifers

Tiziana Di Lorenzo‡, Marco Cifoni§, Barbara Fiasca|, Alessia Di Cioccio|, Diana Maria Paola Galassi|

‡ Institute of Ecosystem Study of the CNR, National Research Council of Italy, Florence, Italy
§ Gran Sasso-Laga National Park, L'Aquila, Italy
| Department of Life, Health and Environmental Sciences, University of L'Aquila, L'Aquila, Italy

Corresponding author: Tiziana Di Lorenzo (tiziana.dilorenzo@ise.cnr.it)

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## Abstract

The ecological risk assessment (ERA) of chemical substances is based on the premise that the protection of the most sensitive taxon safeguards the overall community. Given the severe scarcity of ecotoxicological data concerning groundwater species, we felt urged to consider epigean model species' sensitivity data to determine the safe pesticide concentrations for obligate groundwater dwelling species. To this end, we performed the ERA of pesticide mixtures occurring in eleven Mediterranean porous aquifers (Abruzzo region; central Italy). The evaluation was based on data collected between 2010 and 2015 by the environmental protection agency of Abruzzo region (ARTA Abruzzo) and included 42 pesticides and 1953 samples. We applied a step-wise procedure:

1. we used the Measured Environmental Concentration (MEC);
2. we estimated the Predicted No-Effect Concentration (PNEC) and
3. we established the ecological risk as Risk Quotient (RQ) based on the ∑MECi/PNECi ratio following a concentration addition model for mixtures' toxicity.

The PNEC was regarded as the concentration below which a harmful effect will most likely not occur to the groundwater dwelling fauna. The toxicity data used to compute the PNEC values were obtained from the US. EPA ECOTOX database confining the search to epigean crustaceans. Missing toxicity data were estimated by ECOSAR v.1.11. PNEC

values were calculated by dividing the lowest short-term L(E)C50 value (that refers to the concentration at which 50% of its maximal effect was observed in test species) by appropriate assessment factors (AF). The AF values were selected according to the difference in the sensitivities of groundwater and epigean crustaceans derived from the available studies. Groundwater crustacean species were generally less sensitive to acute exposure to chemicals than the model species *Daphnia magna*. However, they were more sensitive than their epigean relatives when the comparisons were made among organisms sharing the same family/order. This result suggests caution when inferring the sensitivity of groundwater species from that of epigean taxa. The ecological risk was scored using a binary ecological classification suggesting that appreciable risk is likely when RQ≥1. Pesticide mixture risks were often driven by a minimum of 2 to 11 compounds in the eleven aquifers of Abruzzo region. However, the risk-drivers (i.e., individual pesticides explaining the largest share of potential effects) differed substantially among the aquifers. The results of this study have been published by Di Lorenzo et al. (2018).

## Presenting author

Tiziana Di Lorenzo

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## References

- Di Lorenzo T, Cifoni M, Fiasca B, Di Cioccio A, Galassi DMP (2018) Ecological risk assessment of pesticide mixtures in the alluvial aquifers of central Italy: Toward more realistic scenarios for risk mitigation. Science of The Total Environment 644: 161-172. https://doi.org/10.1016/j.scitotenv.2018.06.345