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## Spatial and temporal patterns of ecological risk induced by pesticides in Alqueva reservoir: a case study

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### Abstract

The purpose of this study was to evaluate the potential impact of pesticides detected in the Alqueva reservoir (Guadiana Basin, South Iberian Peninsula) on the aquatic organisms belonging to this ecosystem. For this purpose, the occurrence and risk assessment of 25 pesticides, and of a number of their degradation products, were determined in the Alqueva surface waters. The target pesticides, which belonged to the classes of phenylureas, triazines, chloroacetanilides and organophosphorous, were analysed by isotope dilution on-line solid phase extraction-liquid chromatography tandem mass spectrometry. The aquatic risk assessment, which was based on the risk quotient method ( $RQ = MEC/PNEC$ ; MEC: measured environmental concentrations; PNEC: predicted no-effect concentration) considered three trophic levels: algae, aquatic invertebrates and fish.

The areas (sampling stations) most polluted by pesticides were Sra. Ajuda and Lucefecit, in the northern, and Álamos, in the middle portion of the reservoir. The aquatic risk assessment revealed that, from the various compounds analysed, terbuthylazine, chlorfenvinphos and diazinon presented nonacceptable risk. With the exception of terbuthylazine, that in two areas (Sra. Ajuda and Lucefecit) exhibited high risk ( $RQ > 1$ ) under normal hydrological conditions, the high risk was only estimated in specific periods, with particularly high pesticide concentrations in the water column, that occurred after rainfall events during the period of pesticide application. The locations that had more samples with  $RQ > 1$  were Sra. Ajuda followed by Lucefécit. The use of risk assessment allowed us to conclude that, despite that pesticides' concentrations in the water column fulfill the European environmental quality standards, some compounds show a high ecotoxicological risk for aquatic organisms in the Alqueva ecosystem. The results demonstrate that, to have an efficient risk management process, the regulatory authorities of each country must consider an integrative chemical and ecotoxicological approach.