

## Pesticides Monitoring in Surface Waters of the São Paulo State, Brazil

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**Abstract :** Brazil is a top consumer of pesticides worldwide, and the São Paulo State is one of the highest consumers among the Brazilian federative states. However, representative data about the occurrence of pesticides in surface waters of the São Paulo State is scarce. This paper aims to present the results of pesticides monitoring executed within the Water Quality Monitoring Network of CETESB (The Environmental Agency of the São Paulo State) between the 2018-2022 period. Surface water sampling points (21 to 25) were selected within basins of predominantly agricultural land-use (5 to 85% of cultivated areas). The samples were collected throughout the year, including high-flow and low-flow conditions. The frequency of sampling varied between 6 to 4 times per year. Selection of pesticide molecules for monitoring followed a prioritizing process from EMBRAPA (Brazilian Agricultural Research Corporation) databases of pesticide use. Pesticides extractions in aqueous samples were performed according to USEPA 3510C and 3546 methods following quality assurance and quality control procedures. Determination of pesticides in water (ng L<sup>-1</sup>) extracts were performed by high-performance liquid chromatography coupled with mass spectrometry (HPLC-MS) and by gas chromatography with nitrogen phosphorus (GC-NPD) and electron capture detectors (GC-ECD). The results showed higher frequencies (20- 65%) in surface water samples for Carbendazim (fungicide), Diuron/Tebuthiuron (herbicides) and Fipronil/Imidaclopride (insecticides). The frequency of observations for these pesticides were generally higher in monitoring points located in sugarcane cultivated areas. The following pesticides were most frequently quantified above the Aquatic life benchmarks for freshwater (USEPA Office of Pesticide Programs, 2023) or Brazilian Federal Regulatory Standards (CONAMA Resolution no. 357/2005): Atrazine, Imidaclopride, Carbendazim, 2,4D, Fipronil, and Chlorpyrifos. Higher median concentrations for Diuron and Tebuthiuron in the rainy months (october to march) indicated pesticide transport through surface runoff. However, measurable concentrations in the dry season (april to september) for Fipronil and Imidaclopride also indicates pathways related to subsurface or base flow discharge after pesticide soil infiltration and leaching or dry deposition following pesticide air spraying. With exception to Diuron, no temporal trends related to median concentrations of the most frequently quantified pesticides were observed. These results are important to assist policymakers in the development of strategies aiming at reducing pesticides migration to surface waters from agricultural areas. Further studies will be carried out in selected points to investigate potential risks as a result of pesticides exposure on aquatic biota.

**Keywords :** pesticides monitoring, são paulo state, water quality, surface waters

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