

## Ecological risk estimation of organophosphorus pesticides in riverine ecosystems

### ABSTRACT

Pesticides are of great concern because of their existence in ecosystems at trace concentrations. Worldwide pesticide use and its ecological impacts (i.e., altered environmental distribution and toxicity of pesticides) have increased over time. Exposure and toxicity studies are vital for reducing the extent of pesticide exposure and risk to the environment and humans. Regional regulatory actions may be less relevant in some regions because the contamination and distribution of pesticides vary across regions and countries. The risk quotient (RQ) method was applied to assess the potential risk of organophosphorus pesticides (OPPs), primarily focusing on riverine ecosystems. Using the available ecotoxicity data, aquatic risks from OPPs (diazinon and chlorpyrifos) in the surface water of the Langat River, Selangor, Malaysia were evaluated based on general ( $RQ_m$ ) and worst-case ( $RQ_{ex}$ ) scenarios. Since the ecotoxicity of quinalphos has not been well established, quinalphos was excluded from the risk assessment. The calculated RQs indicate medium risk ( $RQ_m = 0.17$  and  $RQ_{ex} = 0.66$ ;  $0.1 \leq RQ < 1$ ) of overall diazinon. The overall chlorpyrifos exposure was observed at high risk ( $RQ \geq 1$ ) based on  $RQ_m$  and  $RQ_{ex}$  at 1.44 and 4.83, respectively. A contradictory trend of  $RQs > 1$  (high risk) was observed for both the general and worst cases of chlorpyrifos, but only for the worst cases of diazinon at all sites from downstream to upstream regions. Thus, chlorpyrifos posed a higher risk than diazinon along the Langat River, suggesting that organisms and humans could be exposed to potentially high levels of OPPs.

**Keyword:** Organophosphorus pesticide (OPP); Pesticide exposure; Riverine ecosystem; Aquatic; Risk assessment; Risk quotient