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Neonicotinoid insecticide presence in flowing water and wetlands across Canada, impact on pollinators and aquatic invertebrates and risk mitigation with emphasis on canola production

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Due to multiple uses in many crops, systemic efficacy and low toxicity to mammalian invertebrates, the neonicotinoid insecticides have become the most widely used class of insecticide in the world since their introduction in the 1990s. Neonicotinoids are used as seed treatments on >99% of canola hectares planted annually in Canada. In 2017, Health Canada proposed a decision to phase out all agricultural and majority of outdoor uses of neonicotinoid insecticides, based primarily on the adverse effects and risk to aquatic invertebrates. The estimated cost to the Canadian canola industry alone is Cdn\$700 million annually. In response, a comprehensive pan-Canadian water monitoring program for neonicotinoids was undertaken in 2017 and 2018 (the presenter is the co-chair of the pan-Canadian Environmental Monitoring Working Group). Neonicotinoid levels and dissipation in flowing surface water and wetlands across Canada is reported for both years. A total of 879 water samples were analyzed in 2017 and 2,389 in 2018.

The results indicate that typical agricultural uses of neonicotinoids do not pose a widespread threat of risk to aquatic invertebrates in surface waters and wetlands, even when comparing exposure to highly conservative chronic endpoints set by Health Canada. Detection frequency and concentrations were generally low, with concentrations in most samples below the limit of detection. When detected, the neonicotinoid concentrations were typically well below the chronic endpoints and all samples were well below their respective acute endpoints. By mid-July the insecticides were no longer detectable at most of the sampling locations across Canada. Furthermore, the overall mean and median of detections were generally similar between the monitoring years, suggesting that higher concentrations are transient and not a prolonged risk to aquatic life.

Fate and persistence of neonicotinoids in Canadian water bodies is impacted by agricultural use / cropping patterns, precipitation patterns, day length, temperature, soil and water pH, and other factors and these have been analyzed and will be discussed with respect to short and long-term impact to pollinators, beneficial insects and aquatic invertebrates. Additionally, risk mitigation measures have been proposed and experimental results will be presented with emphasis on canola production practices in western Canada.

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