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OPINION

Pesticide use poses harm to SA's water

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SOUTH Africa is the leading user of pesticides in Sub-Saharan Africa, which means that our water resources are potentially at risk of being contaminated by pesticides.

Pesticides are essential for large-scale crop production. However, after application, they can enter surface water or groundwater, where they can potentially persist and cause harm to aquatic organisms or human health.

The theme of this year's World Water Day (22 March) is "Accelerating Change", with a focus on solving the water crisis amid climate change.

With South Africa being a drought-prone country and climate change potentially increasing the occurrence and intensity of droughts, we cannot afford to have our water resources polluted.

Thus, it is key that we preserve and protect our water resources by sustainably managing activities that can affect them. To do this, we must gain a better understanding of pollutants that could contaminate our water, which includes pesticides.

While there are strong regulations in place to monitor the levels of pesticide residues on produce that is exported from South Africa, we do not have regulations for restricting the levels of pesticide pollution in the environment, particularly in water.

This means that our government (i.e., Department of Water and Sanitation) does not have a strategy in place to monitor our rivers for pesticides.

Thus, we do not know which pesticides are persistent in the environment and how much or how many of them are entering our waters. This can be an issue for our country's aquatic ecosystems, as well as for people in rural communities that rely on surface water or groundwater. As South Africans, we will have to live with the consequences of environmental pesticide pollution, while countries that import our produce do not.

The use of pesticides for agriculture is the main driver of pesticide pollution. However, non-agricultural (e.g., forestry, roadside weed control) and residential use are additional sources. It is also important to understand how these contaminants enter our ecosystem – it could be from run-off, air deposition, groundwater input, wastewater input and many others.

It is essential to understand these sources and pathways because we can use this information to create compound-specific solutions, which ultimately minimises the risks involved with pesticide use and the negative effects on communities and aquatic organisms.

To help address the knowledge gaps associated with pesticide contamination, we have been monitoring a list of 50 compounds in the Western Cape by using passive samplers.

Passive samplers are small disks that are placed into rivers, where they collect pesticides via diffusion and sorption.

Diffusion is when molecules move from an area of high concentration (i.e., the water) to an area of low concentration (i.e., passive sampler). Sorption is when a compound (i.e., pesticides) attaches itself to another (i.e., passive sampler) via physical or chemical processes.

Passive sampling is useful because it is a cheap and simple alternative to other forms of environmental sampling, requiring low-cost equipment without the need of a continuous energy source (it is load shedding-proof). Additionally, passive sampling captures pesticides over an extended period. For instance, we deploy passive samplers over a 14-day period, which allows us to calculate a 14-day average concentration of the river water.

Conversely, grab sampling (i.e., taking a water sample with a bottle) only provides a single snapshot in time of the water quality.

We deployed passive samplers in three well-known agricultural areas in Grabouw, Piketberg, and the Hex River Valley.

Each catchment has a specific crop type making up most of its arable land use. For instance, the majority of Grabouw's arable land is used to grow pomme fruit, while Piketberg and the Hex River Valley are for wheat and table grapes, respectively.

Looking at an area with a specific crop type helps us understand if a crop type is related to specific pesticides in the water. The samplers have been placed in rivers every month from March 2022 to March 2023. We are currently building upon a pre-existing dataset from 2017-2019. Our samples were processed and measured using instruments at Stellenbosch University's Central Analytical Facilities (SU-CAF). The methods used at SU-CAF were developed by collaborating partners from the Swiss Federal Institute of Aquatic Science and Technology (Eawag).

Our study, so far, has detected 30 different pesticide compounds, with a select few showing up in high amounts. This illustrates that specific compounds are causing most of the contamination and, thus, should be the focus for mitigation measures. Of particular concern were two compounds, chlorpyrifos and imidacloprid, which exceeded Environmental Quality Standards (EQS).

An EQS value is the minimum concentration at which the most sensitive aquatic organisms may be affected. Comparing pesticide concentrations in the water to an EQS value helps us identify which pesticides may pose a risk to aquatic life. Imidacloprid, a pesticide commonly used to treat mealybugs in vineyards, is particularly concerning because it has exceeded its EQS value in all our samples since 2017.

To better understand the potential environmental and human health risks of pesticide pollution, we need continuous and consistent monitoring programmes for pesticide pollution in agriculturally intensive catchment areas, combined with a recording system of the pesticides farmers use.

With this information, targeted solutions can be developed which will help promote sustainable agricultural practices that will, in turn, benefit both the environment and the farmers (i.e., Integrated Pest Management). Such programmes are vital in ensuring that freshwater resources are not further polluted by pesticides and that the health and well-being of communities that rely on these resources are protected.

As we celebrate World Water Day, it is important to recognise how various types of pollution can affect our precious water resources. By gaining a comprehensive understanding of the problem, we can accelerate the development of effective solutions

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