Vegetative Buffer Soils Reduce Insecticide Transport

Neonicotinoids are a class of insecticides widely used in agriculture to protect crops from a broad spectrum of pests. While neonicotinoids, such as imidacloprid, are valued for their low mammalian toxicity, versatility of application, and systemic nature, they are very water soluble and can persist in the environment. Vegetative buffers are a common conservation practice for reducing surface runoff, soil loss, and agrochemical transport, but their ability to reduce neonicotinoid migration to surface waters has not been studied.

In an article recently published in *Vadose Zone Journal*, an interdisciplinary team of scientists report on the fate and transport of imidacloprid in soils collected from croplands, grass buffers, and riparian vegetative buffers. Researchers conducted laboratory experiments evaluating imidacloprid binding to soils and measured and modeled imidacloprid transport through columns filled with the different soils. The team found that imidacloprid sorption to riparian vegetative buffer soils was double that of cropland soils. Soil organic carbon was the strongest predictor of imidacloprid sorption. Average peak concentrations of imidacloprid concentration occurred at 5.83, 10.8, and 23.8 pore volumes for cropland, grass buffer, and riparian vegetative buffer soils, respectively; thus, indicating that riparian and grass buffer soils retarded imidacloprid leaching to a much greater extent than cropland soil.

Vegetative buffer soils can retain imidacloprid to a greater extent than cropland soils. Soil organic carbon was the strongest predictor of imidacloprid sorption. Average peak concentrations of imidacloprid concentration occurred at 5.83, 10.8, and 23.8 pore volumes for cropland, grass buffer, and riparian vegetative buffer soils, respectively; thus, indicating that riparian and grass buffer soils retarded imidacloprid leaching to a much greater extent than cropland soil.

Vegetative buffer soils can retain imidacloprid to a greater extent than cropland soil and reduce imidacloprid bioavailability and hydrologic transport to water resources. Installation of vegetative buffers along field borders and improved riparian management are potential means for reducing imidacloprid transport in agroecosystems.


Methane Emissions of Different Water Regimes and Marshes

The increasing frequency of extreme drought and intense precipitation events with global warming may affect methane emissions from different types of wetlands by regulating drying–wetting cycles. Prior research has also raised concerns about the accuracy of scenarios based on short-term disturbances in environmental and ecological variables.

In an article recently published in *Vadose Zone Journal*, researchers report on methane emissions in three different water regimes from peatland and gley marsh, the main types in the Sanjiang Plain known as the largest freshwater wetland complex in China.

The team found that large pulses of methane can be emitted during short-duration drying–wetting episodes. In addition, the highest emission pulses were observed between four and nine days after the water table increased according to the models. Peatland soils had higher methane emissions than gley marsh soils under steady water table treatments.

The team highlights the importance of capturing the pulsed emissions after a sudden rise in water-table levels in establishing accurate methane emission budgets. In view of an increased frequency of drought and intense rainfall events in northeast China, high-frequency chamber measurements are necessary to accurately estimate the magnitude of greenhouse gas emissions.


Methane sampling.