Contribution ID: **476** Type: **Poster (+) Presentation**

Pesticide transport in unsaturated soils: from column tests to laboratory lysimeter.

Tuesday, 1 June 2021 10:00 (1 hour)

Raising crop production and at the same time reducing environmental spreading of agrochemicals are two current priorities in agriculture. Balancing these needs a quantitative understanding is needed of infiltration phenomena and agrochemical leaching into the subsoil. To this aim, field studies are undoubtedly the most reliable approach to retrieve representative data. Lysimeters are specific devices installed in fields used for studying percolation of water and, to a lesser extent, of contaminants through the unsaturated zone (Howell et al., 1991). However, full-scale detailed monitoring of water infiltration and more importantly leaching of chemical substances may be complex. To overcome this problem, laboratory flow and transport tests in small scale soil-packed columns (typical size, few cm in diameter, 10 to 20 cm in length) have been traditionally applied to study into details key processes controlling, in general, solute transport (Dontsova et al., 2006), and more specifically the effects of agrochemical applications (Masipan et al., 2016). However, under some circumstances, the reduced size may limit the representativeness of the results, and up-scaling to the field could be limited. This work aims at linking these different experimental scales via a set of infiltration tests performed at three different laboratory scales, namely small columns (1.6 cm in diameter, 11 cm long), intermediate columns (10 cm in diameter, 25 cm long), and laboratory lysimeter (30 cm in diameter, 70 cm long), all packed with the same porous medium (Dorfner silica sand for a set of tests, and a Lufa standard soil for another set). Water flow and transport tests of solutes and of a pesticide (Dicamba) have been carried out to investigate the differences among the scales in terms of operating conditions, hydrodynamic dispersivity, hydraulic conductivity, pesticide interaction with the soil. The transport tests have been performed applying the solute or Dicamba to the top of the columns, followed by a flushing with water (mimicking irrigation and rain events). Injection rates have been properly selected at the three scales to have the same Darcy velocity, thus ensuring comparability. Outflow water has been collected and analyzed at all scales to reconstruct the breakthrough curve. Moreover, in the lab lysimeter, water content, matric potential, pH, EC and ORP have been measured at different depths for a correct reconstruction of the flow field, concentration profiles and breakthrough curves. The experimental data have been fitted using HYDRUS to obtain unsaturated flow and transport parameters. Dicamba showed little interaction with the soil at all scales, and results are comparable among all setups, suggesting that even small columns can be representative of large-scale processes provided that operating conditions are properly selected, even though large-scale setups are necessary while investigating the influence of unsaturated flow in the top soil on pesticide leaching.

Time Block Preference

Time Block A (09:00-12:00 CET)

References

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- Masipan, T., Chotpantarat, S., & Boonkaewwan, S. (2016). Experimental and modelling investigations of tracer transport in variably saturated agricultural soil of Thailand: Column study. Sustainable Environment Research, 26(2), 97-101.
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