

Factors affecting fluopyram degradation coupled with time-dependent adsorption in soils and the effect of these processes on its accumulation and leaching in the soil profile

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Rok wydania

2025

Czasopismo

Science of The Total
Environment

Numer woluminu

996

Strony

180474/1-180474/14

DOI

10.1016/j.scitotenv.2025.180474

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

Fluopyram is a fungicide commonly applied in farming which has led to contamination of soils, crops, and surface water. However, adsorption and degradation processes of fluopyram in soils – crucial for understanding its environmental fate – have not been fully studied. The K_{oc} values obtained for six typical Polish soil profiles and three topsoils from northern and southern Europe, were in the range of 89.8–294.7 mL g⁻¹ for the topsoils and 110.0–2328.0 mL g⁻¹ for the subsoils. Microbial degradation of fluopyram in soils was combined with its time-dependent adsorption that was completed within 5–8 weeks. The half-life values estimated at 20 °C using the two-site nonequilibrium adsorption model coupled with the first-order degradation, and next corrected to the soil water contents at 10 kPa, were in the range of 207–887 d for the topsoils and 1007–4268 d for the subsoils. Neglecting the process of slow adsorption of fluopyram in soils led to large reduction of the calculated half-lives. The regression analysis indicated that its adsorption range and degradation rate can be predicted based on the soil physicochemical and microbiological properties. As follows from the simulations with FOCUS PELMO using the Hamburg scenario, annual application of fluopyram can cause contamination of groundwater and its concentration in the topsoil is much higher than that predicted previously. High concentration of fluopyram in the topsoil and its adsorption by fulvic acids denote a large risk of its transport into the surface water and its uptake by crops.

Adres publiczny

<http://dx.doi.org/10.1016/j.scitotenv.2025.180474>

Strona internetowa wydawcy

<http://www.elsevier.com>

Plik został wygenerowany dnia 2026-10-14 17:51:53

Adres w repozytorium <https://old.chem.uni.wroc.pl/pl/repozytorium/VQ7IqN2>.