PESTICIDE FATE IN THE ENVIRONMENT AND STRATEGIES OF MITIGATION

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The pesticide distribution among the different environmental compartments is quite complex and affected by pesticide chemio-dynamic properties. The soil/water partition coefficient Koc, the pesticide half life DT50, the air/water partition coefficient KH (Henry's constant), the octanol/water partition coefficient log Kow are the most important parameters affecting the pesticide environmental behaviour. In the environment pesticides are distributed in liquid, solid and gaseous phase; their presence in solid phase (for example in sediment or soil) is due to adsorption phenomena that control the distribution in the other phases, while their most mobile portion is located in liquid and gaseous phases. This portion is available for microbial degradation and for vertical or lateral transfer related to ground and surface water contamination. Generally, the solid phase retention minimises the pesticide mobility risk, but makes pesticide disappearance more difficult. Transformation can allows formation of metabolites under the action of chemical, photochemical, biological processes. The life time of pesticides and their persistence in the environment are conditioned by their reactivity versus abiotic processes (photolysis, hydrolysis, redox reactions) or biotic processes (biodegradation, conjugation, metabolisation). Pesticides either in solution or adsorbed on the soil solid phase may undergo a chemical degradation by oxidation or photolysis induced or catalysed by soil components. The abiotic degradation is often incomplete and leads to intermediate substrates for biological reactions. The biotransformation is a complex process requiring several steps and sometimes generating metabolites more polar, soluble, even more toxic than the parent compound due to bacteria, fungi, algae. The biodegradation requires the pesticide bioavailability (function of water solubility, adsorption coefficient Kd and capacity of bacteria to reach adsorption sites) and a sufficient microbial growth. Mitigation of environment contamination can be obtained with biological or management strategies. Among biological mitigation strategy wetlands (natural and artificial), vegetated filter strip and biobed are emerging system. Among management strategies agronomic practices as rotation, reduction of application rate, improved distribution system(nozzles or spray boomer), calibration of spray equipment, improved plant protection products formulation are common practice.

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