Factors influencing the adsorption, desorption, and movement of pesticides in soil

By

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I. Introduction

Seven factors are known to influence the fate and behavior of pesticides in soil systems: (1) chemical decomposition, (2) photochemical decomposition, (3) microbial decomposition, (4) volatilization, (5) movement, (6) plant or organism uptake, and (7) adsorption. The phenomenon of adsorption-desorption directly or indirectly influences the magnitude of the effect of the other six factors. Adsorption, therefore, appears to be one of the major factors affecting the interactions occurring between pesticides and soil colloids.


In a previous review article (Bailey and White 1964), it was shown that such factors as soil or colloid type, physical-chemical nature of the pesticide, soil reaction, temperature, nature of the saturating cation on the colloid exchange sites, and nature of the formulation directly influence the adsorption-desorption of pesticides by soil systems. These topics and their role in adsorption will be re-examined in light of current literature. In addition, such topics as (1) mathematical models describing adsorption processes, (2) detailed examination of adsorption mechanisms, (3) the nature and role of surface forces and surface acidity in pesticide-soil colloid interactions, (4) role of spectroscopy in elucidation of pesticide-soil colloid complexes, and (5) movement of pesticides through and off of soil surfaces are treated. For sake of convenience the topics (1) adsorption and desorption of pesticides by soil colloids and (2) leaching and movement of pesticides in, through, and over soil surfaces will be treated separately.

A portion of the literature to be cited concerns the reactivity of soil constituents with organic compounds that are not currently recognized as pesticides. However, in general, pesticides are only organic com-