

FATE AND TRANSPORT OF NEONICOTINOID INSECTICIDES IN AGRICULTURAL SOIL

Yang Li and Yadong Li

Department of Civil and Environmental Engineering, Jackson State University, Jackson, MS 39217-0168, USA

Abstract: Neonicotinoids are a new generation of insecticides and are the most widely used in the world. It is imperative to understand the fate and transport of neonicotinoids in the soil environment in order to evaluate the potential environmental impacts of their uses and to establish environmentally sound regulations and practices. This research is focused on degradation and sorption/desorption of clothianidin in three different agricultural soils in the state of Mississippi. The sorption coefficient K_d was found to vary from 0.605 to 1.878 in different soils in different depths. The K_d values showed strongly correlation with the organic carbon content and pH. The desorption coefficient $1/n_{-des}$ indicated that all sorption processes were hysteretic. The desorption rate increased with the decreases in organic carbon content and K_d value. The degradation rate of clothianidin varied with the soils and depths. The half-life in the soils ranged from 109 to 281 d. The degradation rate decreased with the increase in soil depth. The Groundwater Ubiquity Score (GUS) calculated from the K_d value and half-life indicated that clothianidin in the soils is considered as a potential leacher which means it have a potential to permeate to groundwater.

Keywords: Neonicotinoid Insecticide, Clothiandin, Soil, Sorption, Degradation, fate and transport