



## Field Experiments in Transport of Pesticides in Tropical Soils in Hawaii

**M. Sanda** (1), C. Ray (2), J. Dusek (1), J. Lichwa (2), M. Sobotkova (1) and B. Loo (3)

(1) Faculty of Civil Engineering, Czech Technical University, Prague, Czech Republic  
(martin.sanda@fsv.cvut.cz)

(2) Water Resources Research Center, University of Hawaii at Manoa, Honolulu, USA  
(cray@hawaii.edu)

(3) Hawaii Department of Agriculture, Chemical Residues Laboratory Facility, Pearl City, USA  
(binh.t.loo@hawaii.gov)

Past incidences of ground water contamination from nematicides and herbicides in Hawaii has focused on a progressive approach to pesticide registration in Hawaii. The state of Hawaii, in early 1990's made an assessment of the pesticides used in Hawaii and their potential to leach to ground water. Since there is increased pressure to bring new agricultural chemicals to Hawaii, the state and the University of Hawaii work together to evaluate five EPA-registered chemicals for their leachability in Hawaii soils.

Three herbicides (s-metolachlor, sulfometuron methyl and imazaquin), a fungicide (trifloxystrobin), and an insecticide (imidacloprid) were tested for their ability to leach in various tropical soils in Hawaii. In addition, herbicide atrazine and potassium bromide ion were used as two reference chemicals in the study. Label rates of these chemicals for agriculture or insecticidal use were applied to tilled soils except for KBr. Five test sites at differing topographic, climatic and soil conditions were selected in the Hawaiian islands: three on Oahu, one on Maui and one on Kauai. Each site had four test plots; two for herbicides and two for insecticide/fungicide. No crops were grown and the soil surface was covered with a thin layer of mulch to prevent weed growth and decrease water evaporation from the soil surface. An irrigation system was set up at each site to apply water at close to potential evapotranspiration rate to induce

leaching. Disturbed soil samples were collected on the day after pesticide application and in one to four week intervals for four months. Soil hydraulic and climatic data from each site were collected during the same period. Soil samples collected in the field to a depth of 2.1 m were analyzed for the content of the pesticides and bromide, yielding concentration profiles for elapsed times of 1 day to 16 weeks. Prior to pesticide application, soil profiles were also characterized for pH, organic carbon content and basic nutrients: P, K, Mg, Ca. Undisturbed soil core samples were taken and sets of water-retention curves were developed in the laboratory. Field tests for unsaturated and saturated hydraulic conductivity using tension disc infiltrometers were carried out at all sites. To render the complexity of processes in the field, laboratory tests on the sorption and degradation of the chemical compounds were carried out for all 5 sites and 6 pesticides by means of HPLC and GC/MS. Selected degradation products were tested for their sorption to soils.

The physico-chemical properties of soils and pesticides, evaluated from this study will be used to determine if these compounds will be allowed for unrestricted use or with some restrictions. This information will be used by the state of Hawaii to classify this group of chemicals for intra-state sale and use.