

Validation of the AGDISP model for predicting airborne atrazine spray drift: A South African ground application case study

Sifiso A. Nsibande ^a, James M. Dabrowski ^b, Etienne van der Walt ^c, Annette Venter ^c, Patricia B.C. Forbes ^a

^a Department of Chemistry, Faculty of Natural and Agricultural Sciences, University of Pretoria, Lynnwood Road, Pretoria 0002, South Africa

^b CSIR, Natural Resources and Environment, PO Box 395, Pretoria 0001, South Africa

^c Agricultural Research Council, Plant Protection Research Institute, Private Bag X134, Queenswood 0121, South Africa

Abstract:

Air dispersion software models for evaluating pesticide spray drift during application have been developed that can potentially serve as a cheaper convenient alternative to field monitoring campaigns. Such models require validation against field monitoring data in order for them to be employed with confidence, especially when they are used to implement regulatory measures or to evaluate potential human exposure levels. In this case study, off-target pesticide drift was monitored during ground application of a pesticide mixture to a sorghum field in South Africa. Atrazine was used as a drift tracer. High volume air sampling onto polyurethane foam (PUF) was conducted at six downwind locations and at four heights at each sampling point. Additional data, including meteorological information, required to simulate the spray drift with the AGDISP® air dispersion model was collected. The PUF plugs were extracted by a plunger method utilizing a hexane:acetone mixture with analysis by GC-NPD (94.5% recovery, 3.3% RSD, and LOD 8.7pg). Atrazine concentrations ranged from 4.55ngL(-1) adjacent to the field to 186pgL(-1) at 400m downwind. These results compared favourably with modeled output data, resulting in the validation of the model up to 400m from the application site for the first time. Sensitivity studies showed the importance of droplet size distribution on spray drift, which highlighted the need for good nozzle maintenance. Results of this case study indicate that the model may provide meaningful input into environmental and human health risk assessment studies in South Africa and other developing countries.