

STATISTICAL COMPARISONS OF AGDISP PREDICTION WITH MISSION III DATA

Baozhong Duan, Karl Mierzejewski, and William G. Yendol
Pesticide Research Laboratory, Department of Entomology,
Pennsylvania State University, University Park, PA 16802

ABSTRACT

Statistical comparison of AGDISP prediction were made against data obtained during aerial spray field trials ("Mission III") conducted in March 1987 at the APHIS Facility, Moore Air Base, Edinburg, Texas, by the NEFAAT group (Northeast Forest Aerial Application Technology). Seven out of twenty one runs were observed and predicted means (O and P), mean bias error (d), standard deviation of the difference (σ_d), root mean square error of the difference (RMSE), and average absolute gross error of the difference (ldl), index of agreement (r), variance comparison (Var), fraction of positive residuals (f_p) and average relative error ($RE=RMSE/O$) of prediction.

Also, the test of the sensitivity of AGDISP to its input parameters was done in this study. AGDISP was first run by using parameters that were designated as the "typical condition". The meteorological parameters were obtained by averaging each variable over twenty one runs, those for aircraft, such as aircraft weight, flight height and speed, were average values in the field trials, and nozzle configuration and a droplet spectrum were the same as used during field trials.

Then, AGDISP was run for several test cases and the same statistical parameters as mentioned above were calculated using predictions for these cases and the "typical condition".

The results of our studies indicate the following:

1. Without applying the catch efficiency to measure data, the average relative errors of AGDISP prediction over the seven runs was 70% and 80% for number and volume deposition, respectively. The ranges of errors for the individual runs were from 32% to 158% for droplet number density and from 43% to 208% for volume density. For the measurement data corrected for collection efficiency of 0.7, these mean errors were 83% and 81% for droplet number and volume density, respectively.
2. When a sensitivity study was conducted with AGDISP, with variations in flight height within 30% of the normal height of 15.5 m, predictions by AGDISP varied by 61% and 27% for droplet number and volume density, respectively.
3. For application under wet or dry spray conditions, AGDISP predicted variations in volume deposition within 82% of that for typical condition. With light winds (<1 m/s), differences in deposition predicted by AGDISP were within 42% of "typical condition" for droplet number density and zero for volume. While with strong wind (about 7 m/s), these values are 20% and 36%.
4. When half the number of nozzles fitted to the aircraft were modelled, or no vertical offset was included in the input parameters, AGDISP outputs varied by up to 10% in volume deposition and up to 5% in droplet number density when compared to runs made under the actual configuration. With 10 nozzles or uniform distribution along the spray boom, variations in deposition were within 38% of typical values.
5. Variations in AGDISP output with a four size droplet spectrum as input parameters were within 6% and 18% of that obtained with an eight size spectrum for droplet volume and number density, respectively. With a single size spectrum, predicted variations in droplet volume and number density were 73% and 104% of that with the eight spectrum.