The University of Georgia

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Dear Jim,

In this letter I will outline my opinion concerning the
appropriateness of the statistical analysis of the data from
ASPCRO's Termiticide Soil Residue Study and the proposed national
soil residue requirements based on those data.

This study was undertaken for the purpose of establishing
national standard residue requirements for those termiticides
registered as of 1991. I believe the protocol for this study was
appropriate for examination of soil residue analysis of Pest
Control Operator field applications considering the time and
monetary constraints placed on the participants. The protocol
required standardization of application technique and equipment
in order to reduce the potential variability in application of a
termiticide soil barrier due to technique or equipment choice.
However, the protocol attempted to capture the variability
inherent in the different soil types and climatic influences
which could affect termiticide soil residue recovery. The data
certainly reflects the variability inherent in analysis of
termiticide soil residues from four different states. It must be
remembered that reflecting this variability was an expressed
intent of the protocol.

We live in an imperfect world. These data highlight the
perplexities involved in defining a proper termiticide
application. This is the only data set I am aware of that is
applicable to "real world" termiticide application practices and
regulatory soil sample analysis. This study, undertaken in good
faith, to obtain information relevant to setting a national
standard for termiticide soil residue requirements was conducted
and the data analyzed in a manner appropriate to its original
intent and most certainly was a learning experience for the
parties involved.

Initial analysis showed that the soil residue data were not normally distributed. Because of this, a non-linear mathematical model was required to properly evaluate the data. The three parameter Weibull model was an appropriate choice. The goodness of fit (Kolmogorov D) test with the Weibull model on the Day 1 soil residue data provided a reasonable fit for each of the termiticides tested. Projecting a residue estimate based on first-order kinetics degradation curves, provided by the USDA Forest Service Forestry Services Laboratory at Gulfport, MS, to obtain residue requirements for Days 30, 90, and 180 is a reasonable use of the available data as applied to the ASPCRO soil residue study.

Given the myriad potential variables which could affect termiticide residue distribution following application, soil sample collection, and soil residue analysis it is appropriate to examine the data to view the potential for regulatory action being taken against applicators that make a by-the-label application. By examining the percentage of soil samples that fail to meet the projected soil residue standards predicted by the Weibull distributions and first-order kinetics models one can estimate how well the data fit the statistical model. The percent of Day 1 and Day 30 samples which fail to meet the expected standard requirements based on the Weibull projections for 30 days post-treatment was 5.3%. If one considers that 2 out of 2 samples are required to fail before regulatory action is taken, then 4.7% of the Day 1 and Day 30 samples fail to meet the 30-day post treatment requirements based on the Weibull projections. These data, therefore, meet the confidence limits set by the statistical model and should be considered statistically appropriate. Using the projected Day 90 residue standards and comparing the Day 1 and Day 30 data to this standard shows that 3% of the samples fail to meet the standard. Given that regulatory action would be taken only after 2 out of 2 samples failed then 2% of the ASPCRO sites fail to meet the Day 90 standard. Examining the Day 1, 30, and 90 data using the 180 Day requirements then 2.6% of the samples fail and regulatory action would be taken against 1.9% of the sites using the 2 out of 2 sample rule. Examination of the data indicate that the percentage of soil samples which fail to meet the requirements set by the Weibull model fall within the confidence limits of the statistics and therefore confirm the validity of the statistical model used in analysis for establishment of the national standard soil residue requirements.

Interpretation of experimental data involves not only the use of statistics, which are an important tool, but must include the experience and knowledge base of the interpreting scientist to determine the biological ("real world") significance of the data. Therefore, after review of all the data, I would suggest a compromise set of regulatory standards be implemented which would meet the needs of the regulatory community, address concerns of the industry, and fit the available data set. Instead of requiring separate standards for 30, 90, and 180 days post-

treatment I would apply a single standard residue requirement for each termiticide but restrict residue analysis sampling to no more than 6 months post-treatment. This compromise would involve using the day 180 projected 5th percentile residue requirements based on the Weibull analysis and first order kinetics degradation curves as the residue requirement for samples taken up to 180 days post-treatment for all the termiticides tested with two minor adjustments. The suggested requirements would be Tribute - 110 ppm, Dragnet - 81 ppm, Torpedo - 63 ppm, Prevail - 46 ppm, Demon - 28 ppm, and Dursban - 51 ppm. These requirements can be justified by the entire data set which shows that 0.9% of the samples fail to meet these standards and none of the sites would have been cited for failure to meet regulatory requirements based on the 2 out of 2 failed samples criterion. I believe this standard would serve the regulatory purpose of the national standard soil residue requirements and assure the industry that the potential for regulatory action against proper applications would be minimal.

Sincerely,

Brian T. Forschler
Assistant Professor