Data set for Hyperspectral Imagery for Large Area Survey of Organophosphate Pesticides

Data sets generated for the peer-reviewed journal article consisted of highly specialized instrumentation, including a Long-Wave Infrared (LWIR, 8-12 um) Imaging Fourier Transform Spectrometer (IFTS). The resulting data generates graphs or spectral contrast images from the instrumentation, resulting in the Figures provided in the paper. Specific numerical values were not collected because they are not data points correlating to traditional data sets, but rather pixels on an array. The pixel numbers (as detailed in the paper) correspond to the specific data points that were used to generate the presence/absence of the contaminated surface versus the blank surface. Images are generated and were provided as collected from the instrument (Figures 1, 2, 5, 6).

Different solution concentrations were developed to measure the magnitude of the absorbance bands by the Fourier Transform-Infrared Spectrometer (FT-IR). The observed spectra were then correlated to a standard reference spectrum for the compound of interest in solution (liquid dimethyl methylphosphonate-DMMP). The standard reference spectrum was that from National Institute of Standards and Technology (NIST). The absorbance bands used to identify DMMP were collected from the FT-IR instrument and compared to the NIST reference standard (Figures 3, 4, 7).

Detection Limits were roughly calculated using the lowest concentration solutions of DMMP and comparing them to the spectral signatures in the reference spectrum (NIST). Thus, the amount of DMMP applied to the surface at the lowest concentration over a defined surface area allowed for an upper limit of detection and are meant to be suggestive when corresponding to detection limits. A thorough detection limit determination was out of the scope of the project. This study was a proof of concept that hyperspectral imaging could be used to detect a chemical at a specific concentration. The data that are presented in the paper are based on what was observed in the Figures and concentrations that developed for the chemical (DMMP).