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Concentration of Diazinon in Air of a Retail Garden Store

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Considerable research has been carried out on the extent of exposure to organophosphorus insecticides and associated hazards among pesticide formulators (BROKOPP et al. 1981), packagers (JONES 1982), applicators (CARMAN et al. 1982) and field workers (WOJECK and NIGG 1980; KRAUS et al. 1977, 1981; STAIFF et al. 1982; MORSE et al. 1982). The study of worker exposure to these compounds has been the subject of several reviews (KAY 1974; NIGG 1980; MATSUMURA and MADHUKAR 1980). Whereas the respiratory route of exposure has been studied as related to individuals mixing and spraying pesticides (OUDIBIER et al. 1974) no studies have been done on the extent of exposure of organophosphorus compounds to customers and clerks in retail stores where such packaged materials are sold. In the work reported, the concentration of diazinon [0,0-diethyl O-(2-isopropyl-4-methyl-6-pyrimidinyl) phosphorothioate] was determined in the air of a retail garden store which sold the insecticide.

MATERIALS AND METHODS

The retail garden store chosen for air sampling displayed diazinon on open shelves up to a height of two meters as a liquid formulation in bottles and as various dry products in cardboard canisters and foil-lined bags. A 2.0 cm i.d. borosilocate glass tube containing two tightly-fitting polyurethane foam plugs (2.5 cm in diameter, 5 cm long and initially Soxhlet-extracted with hexane to remove possible impurities) was placed at a height of 1.8 meters in the aisle (1.3 m wide) between two sets of shelves displaying the formulated materials. One end of the tube was connected through tygon tubing to a pump located seven meters away. Air was pumped through the glass tube containing the plugs for 14 hours at a rate of 52 liters per minute.

At the end of this period, the two plugs were separately Soxhlet-extracted with 100 ml of hexane for four hours. Electron impact and chemical ionization mass spectra were obtained on the hexane extracts with a Finnigan Model 3300 GC/MS system. Approximately four mls of the extract were evaporated almost to dryness and then injected into a 5 ft x 2 mm i.d. glass column packed with 3% OV-101 on 100/120 mesh GasChrom-Q. Carrier gas flow was 15 ml/min helium for electron impact and methane for chemical ionization mass spectrometry. Column temperature was initially 80°C for two minutes and then programmed at 10°/min up to 280°C. The electron impact

mass spectra of the eluted peaks were compared visually with reference spectra of common insecticides. A positive identification was made for diazinon with a confirmation of the molecular weight of 304 obtained from the chemical ionization data. The hexane solutions were appropriately diluted and the amount of diazinon was determined by gas chromatography using a Tracor Model MT-220 gas chromatograph equipped with a Model 702 NP detector. The column was borosilicate glass, 2 m long, 2 mm i.d. and containing 3% OV-101 on 100/120 mesh Gas Chrom-Q. The operating temperatures for the column, flash heater and detector were 190°, 230° and 250°C, respectively. The gas flow rates for helium, hydrogen and air were 50, 4.7 and 125 cc per min, respectively. The retention time of diazinon was 3.2 min.

RESULTS AND DISCUSSION

The concentration of diazinon that was found in the air based on the 14-hour period of pumping through the polyurethane filters was 3.4 micrograms per cubic meter. All of the diazinon was found in the first polyurethane plug closest to the air inlet. Diazinon was not found in the second plug or in unused (control) plugs which were similarly Soxhlet-extracted and analyzed.

The concentration of such pesticides in air will depend on a number of factors including the type of formulation, the vapor pressure of the compound (that of diazinon is 1.4×10^{-4} mm Hg at 20°C), air temperature, type and condition (torn packages, loose lids) of containers, prior spills and types of floor covering. The threshold limit value for diazinon in air is 100 micrograms per cubic meter (NIOSH REGISTRY 1978). The concentration of vapors of the insecticide found in this study would therefore not appear to constitute a hazard to store personnel or customers. Other factors which may affect toxicity, however, would include duration of exposure, human susceptibility differences and the net toxicity from several pesticides present in air simultaneously.

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