DETERMINATION OF MITC IN AIR DOWNWIND OF FIELDS TREATED WITH METAM SODIUM BY DRIP IRRIGATION

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Metam sodium (MS, CH_3NHCS_2Na) is used in agriculture as a soil treatment to control weeds, nematodes, fungi, and soil insects. When diluted in water, and especially in the presence of acids and heavy metal salts, MS decomposes into MITC ($CH_3N=C=S$) which is the chemical that actually accomplishes the soil fumigation:

$$CH_3NHCS_2Na + H_2O \text{ -------> } CH_3N=C=S + H_2S + Na^+ + {}^-OH$$

MITC

MITC is volatile and diffuses out of the soil into the atmosphere over treated fields, where it can move into non-target areas by diffusion and advection.

In a study conducted during 1997 near Irvine, California, air concentrations of MITC were determined by charcoal tube sampling adjacent to and downwind from two fields treated with MS by injection into the drip irrigation system (~10 cm depth), one with and one without partial soil coverage with a plastic tarp. After sampling for about four hours per sampling period, the charcoal tubes were extracted with a 50:50 mix of ethyl acetate and carbon disulfide and MITC residues were determined using nitrogen-phosphorus thermionic detection. The two study fields showed airborne MITC residues essentially immediately upon application of the parent MS and for periods up to 48 hours post-application. Measurable MITC residues were found at all of the sampling stations, up to 50 meters downwind. MITC levels in air were typically 1-3 orders of magnitude greater than the limit of quantitation (~100 ng/m^3). For the sampling stations immediately around each field, the untarped field showed the highest levels during application, while the tarped field showed the highest levels during the first sampling period after application (~four hours post-application). For these same sampling stations over the period of the study, a comparison of MITC concentrations in air showed that the tarped field contributed overall lower downwind atmospheric residue levels. Compared to other studies, MITC residues in air measured during and immediately after application by drip irrigation injection were 1-2 orders of magnitude lower than those associated with applications involving surface irrigation (e.g., 10-200 $\mu g/m^3$, this study, compared to about 4000-7000 $\mu g/m^3$ in a study by the California Department of Pesticide Regulation). The data from studies such as this may be used to assess and minimize exposure to farm workers and nearby residents.

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