

Airborne paraquat measurement and its exposure to spray operators in treated field environment

ABSTRACT

Airborne residue was collected for 12 h day time (4 h sampling intervals) before and after from a paraquat treated field using passive patch samplers (cotton gauge, cellulose filter & PUF patches) and active samplers (quartz filter for particulates & PUF plug for vapor). Paraquat residue was detected by high performance liquid chromatography (HPLC) with UV detector after extracting the samples according to "NIOSH method 5003" with some modification. Pre-spray measurements by both passive and active sampling showed no detection of paraquat, whereas in post-spray measurement, peak average residue level (15.56 ng cm⁻²) were detected on cotton gauge patches in first 0–4 h post-spray passive sampling, whereas the average residue levels detected in the second post spray event were not significantly different among the three passives patch samplers. In post spray active sampling, paraquat was detected only on quartz filter samples (not on PUF plug) revealed that in the air paraquat is associated with particles rather than vapour and paraquat air concentration was detected at higher level in first 0–4 h and sharply decline in second 4–8 post-spray period. The highest paraquat air concentration measured during the 25 min spray application at operator's breathing zone was 125 µg m⁻³ that was slightly above the TLV (threshold limit value) and REL (recommended exposure limit) (100 µg m⁻³) of ACGIH (American Conference of Government Industrial Hygienists) and NIOSH (National Institute for Occupational Safety & Health, 1994). In addition, potential dermal and inhalation exposure dose (theoretically) estimated by extrapolating air residue data showed higher value than the proposed acceptable operator exposure level (0.0005 mg kg⁻¹ day⁻¹).

Keyword: Paraquat; Airborne residue; Active sampling; Passive sampling